



Model V2000

OPERATIONS manual

IMAGE SERVER 2000



For use with Software Version 2.10

Image Server Model V-2000B

July 2005

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IMAGE SERVER 2000™

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Preface

This manual provides installation, setup and operating instructions for 360 Systems' Image Server 2000™ and the Multi-Format Image Server, which includes DV and graphics capability. It is organized to provide quick access to topics of primary interest. An extensive Table of Contents is provided at the beginning, and a subject Index at the end, to assist in locating information.

If you have already used hard disk video servers (or VTRs), you may find discussion of the basic server to be covering familiar topics. However, it is strongly recommended that engineering managers and staff members operating the Image Server read through this manual. Being familiar with its operation can prevent operational mistakes, and will make all users aware of important set-up and maintenance issues.

Software and Operations Manual Revisions

Software revisions are released from time-to-time that introduce new product features, or improve the performance of the product. When such revisions are shipped in the form of a CD-ROM, printed operational notes will be included. When revisions are introduced in the course of product production, an updated Operations Manual will be shipped with new servers.

The title page of an Operations Manual indicates its revision number, which should always match the software revision of the server with which it is used. Operations Manuals for the latest revision may be obtained from 360 Systems Customer Service, or from 360 Systems' web site.

Definitions

For the purposes of this manual, "GPI" is defined as "General Purpose Interface," with associated inputs (GPI Inputs) and outputs (GPI Outputs).

Typographical Conventions

The following typographical conventions are used to clarify meaning:

Connector or indicator labeling that appears on the unit is shown in **Arial Narrow Bold**.

GUI menu items are shown in **Arial Bold**.

GUI sub-menu paths are shown by the > symbol.

Feedback on this Manual

Your comments are welcome. If anything in this manual seems unclear, please let us know by sending an email to support@360systems.com.

Safety Notices

Safety Terms and Symbols

THE FOLLOWING WARNING SYMBOLS ARE USED IN THIS MANUAL :



ENGLISH	ATTENTION: REFER TO OWNER'S MANUAL FOR IMPORTANT INFORMATION.
FRANÇAIS	ATTENTION: VEUILLEZ VOUS RÉFÉRER AU MODE D'EMPLOI POUR UNE INFORMATION IMPORTANTE.
ITALIANO	ATTENZIONE: FATE RIFERIMENTO AL MANUALE PER INFORMAZIONI IMPORTANTI.
ESPAÑOL	ATENCIÓN: FAVOR DE REFERIR AL MANUAL DE OPERACION POR INFORMACION IMPORTANTE.



ENGLISH	WARNING: ELECTRICAL SHOCK HAZARD.
FRANÇAIS	AVERTISSEMENT: DANGER DE CHOC ÉLECTRIQUE.
ITALIANO	AVVERTIMENTO: PERICOLO DI SHOCK ELETTRICO.
ESPAÑOL	ADVERTENCIA: PELIGRO DE CHOQUE ELECTRICO.

General Safety Caution

Heed the following important cautions regarding the Image Server in order to avoid personal injury or equipment damage.

Only qualified personnel should perform installation and service. Refer to appropriate sections of this product manual for instruction. Contact 360 Systems Customer Support for further explanation, or to clarify any uncertainty.

Disconnect the power cord before removing the cover.

Personal Injury Precautions

To avoid electric shock, do not operate this product with covers removed.

To avoid risk of fire, replace the power cord only with same type and rating as specified. Replace damaged power cords immediately.

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, do not remove or modify the contacts on the plug.

Prevent the power cord from being walked on, pinched, or abraded.

To reduce the risk of fire or electric shock, do not expose this unit to rain or moisture.

Remove jewelry, such as rings, watches, or necklaces before servicing this equipment.



Product Damage Precautions

Image Server recorders contain hard disk drives and other fragile electronic and mechanical devices. While this product is very reliable, it is still vulnerable to shock. Handle it with care, and exercise caution not to drop or bump the recorder as damage to internal components may result. Turn off power before moving the server.

Do not obstruct air vents. Maintain an ambient temperature below 30°C (86°F).

Clean only with a soft cloth dampened with water. Do not spray cleaners or solvents directly on the product.

CAUTION: Replace only with the same, or equivalent, battery type. BR and CR Lithium batteries are safe for disposal in municipal waste. Batteries should be fully discharged prior to disposal.

CAUTION: Never use the power supply switch to shutdown the Image Server. Doing so may cause errors in the hard disk array. Should this happen, the array can be reinitialized without any data loss; however, the process may take several hours. Shutdown the system only by momentarily pressing the front panel power button, or through the On-Screen user interface.

Product Registration

Important – As the owner of new capital equipment, you will want to take advantage of the product information, enhancements, upgrades, or notifications issued by 360 Systems. Send in your Warranty Card so 360 Systems can remain in contact with you. Mail or fax it to 360 Systems offices in the USA at the address given below.

Product Improvements and Upgrades

360 Systems reserves the right to make changes and/or improvements to its products without incurring any obligation to incorporate such changes or improvements in units previously sold. Certain features mentioned in this document may not be present in all models. Image Servers are not offered for sale in all countries.

Trademarks

Image Server 2000, Multi-Format Image Server, 360 Systems, 360 Systems Broadcast, Bit-for-Bit, and Direct Digital Import are trademarks or registered trademarks of 360 Systems in the U.S. and/or foreign countries. Other trademarks referred to in this document are the property of their respective owners.

Software Copyrights

Software in this product is based on the work of, or is copyright by, 360 Systems, SuSE® GmbH, Montavista, Trolltech, and FreeType Team. Copyright 2003-2005 by 360 Systems.

Video and Audio Copyright Reminder

It is illegal to use this product to make copies of copyrighted material without the express permission of the copyright holder.



Introduction

360 Systems' Image Server 2000™ and Multi-Format Image Server are multi-stream video recorder/servers designed for television broadcast, production, and Pro-AV applications. Image Servers can play three independent video streams at once, and store up to 170 hours of MPEG-2 video, with four audio channels per video stream, in just 3½" of rack space. The server's extensive feature set makes it an excellent choice for VTR replacement, automation, remote trucks, P-E-G applications, corporate and entertainment presentations. The Image Server is produced in both NTSC and PAL models. References in this document to frame counts other than 29.97 or 30 frames should be understood to be a PAL example.

The Transition to a Digital Plant

The Image Server smoothes the transition to digital production and broadcasting by providing both composite video (VDCP) and serial digital (SDI) interfaces, plus network transfers in MXF format over Gigabit Ethernet. It's never necessary to add additional video A/D or D/A converters, and a full complement of premium-quality MPEG-2 codecs is included as standard equipment. The server's dual analog and digital personality—for both video and audio—lets it fit seamlessly into an existing analog facility, or become part of a new digital build-out. Apart from serving its intended purposes, the Image Server is also valuable for its ability to convert between different analog and digital media formats in real-time.

Exceptional Storage Capacity

The Image Server's program storage is scaleable to suit the needs of both small and large users. It houses four hard drives within its compact enclosure, providing from 52 to over 170 hours of storage at 12 Mb/s (Megabits per second). Storage time is proportional at other data rates. The server's RAID-5 disk array provides a high level of security for stored programs. By spreading parity information across all drives, the RAID array keeps the server in service, even with a failed drive. The multi-drive array also generates the high data rates needed for multiple video streams at up to 50 Mb/s, and enables fast program transfers through the Gigabit Ethernet ports.

Drive Size	Storage Capacity (4 drives)	Time @ 12 Mb/s 2 audio channels	Time @ 8 Mb/s 2 audio channels
120 GB	480 GB	52 hours	72 hours
250 GB	1.0 TB	112 hours	150 hours
400 GB	1.6 TB	170 hours	250 hours

IMAGE SERVER STORAGE TIMES

The Image Server's unique ability to play two video streams while recording another, and at the same time perform network file transfers over Ethernet, makes it far more than just a replacement for a VTR.

Image Servers Support Traditional VTR Functions

The Image Server is a perfect drop-in replacement for popular VTRs. It saves costs for tape, machine maintenance, cassette prep, and storage. Its three output channels perform any combination of tasks, including responding to GUI or automation commands, clip trimming or browsing.

Unlike a VTR, the Image Server can simultaneously record and play a program. A new recording can start at any time, even when two simultaneous playbacks are in progress. As a VTR replacement, the Image Server is controlled through a standard serial interface. Many popular serial protocols are supported, allowing the Image Server to immediately operate with the controllers you already own. These include VDCP, Odetics, P2, AMX and Crestron. Six "GPI" Input and Output control channels are also provided.

Compatibility with Automation Controllers

Image Servers work with automation controllers from many different manufacturers. They use established VDCP and Odetics® protocols and provide a 9-pin control input port for each server channel, for maximum flexibility. 360 Systems' Automation Partners provide controllers for applications ranging from affordable systems for P-E-G and Pro-AV, up to large-scale broadcast solutions. Contact a 360 Systems application engineer for assistance with your requirements.

Remote Controls

Hardware accessories are available from third-party manufacturers to perform transport control, trimming, clip replay and playlisting (automation). A table of approved controllers is provided elsewhere in this manual. Contact 360 Systems Sales Support team for assistance with a specific application.

The Image Server also provides six GPI inputs for remote play, stop, and record capability from push-button panels or other GPI-controlled equipment. Six outputs are also provided for command acknowledgement, and may drive LEDs or logic inputs.

Extended Feature Set

The Image Server encodes video in MPEG-2 format, in 4:2:2 Profile with data rates to 50 Mb/s, or in Main Profile from 2 to 15 Mb/s. Both I-frame and long-GOP formats are supported. MPEG-2 file transfers in MXF-format are compatible with servers from other market leaders.

The DV and Graphics Option (and the Multi-Format Image Server) allows Direct Digital Import™ of DV and TARGA files over Ethernet. DV-25 files may be edited, playlisted, stored and played out. TARGA files will be converted into separate MPEG-2 Key-and-Fill files, which can then be played as a synchronized pair for downstream compositing in a switcher.

As standard equipment, the Image Server includes LTC and VITC time code capabilities, closed-captioning, VDCP, P2 and Odetics 9-pin control, GPI inputs and outputs, and Gigabit Ethernet ports. Embedded audio is available as an option.



Full Slate of Audio Features

Image Servers include both analog and digital audio circuits, making it an important tool in the transition to digital broadcasting. It includes gold XLR connectors for audio inputs and outputs, and each can be configured for either AES/EBU digital or +4 dBu balanced analog. SDI embedded audio is also available as an option. In discrete digital format, each video program can have four channels of audio, whereas analog I/O provides two channels. (An AES/EBU line on a single XLR connector carries *two* audio channels, so a given number of XLR connectors make more channels possible in digital format.)

360 Systems brings over 30 years experience in broadcast and pro-audio to the audio design of Image Servers. It utilizes a 24-bit word, and delivers a 20 dB improvement in SNR (10 times!) compared with older 16-bit audio systems. An insertable sample-rate converter is included, plus input circuits with excellent hum and RF rejection, and 20 dB of headroom. 360 Systems' Bit-for-Bit® design strategy guarantees that when a Dolby®-E, Dolby AC3, or any other encoded program is recorded, it will play back correctly.

On-Screen Graphic User Interface

The Image Server's On-Screen graphic user interface (GUI) gives fast access to all server functions. It is controlled by a standard keyboard and mouse (supplied) and requires only a VESA-compliant SVGA display.

The GUI displays a complete control panel for each server channel, which includes transport control buttons, clip file management and head and tail trimming, allowing the Image Server to operate as three self-contained VTR equivalents.

System configuration is clear and straightforward with the On-Screen GUI. It provides access to MPEG-2 encoding parameters, audio channel and time-code settings. Whenever new server features are installed (using the built-in CD-ROM drive) new set-up parameters and user-interface features become immediately available.

The GUI can be remotely accessed by a Windows PC through an Ethernet link, or of a wide-area connection using a high-security remote KVM product. Contact 360 Systems sales for complete information on these options.

MXF Networking over Gigabit Ethernet

Image Servers move beyond providing just a simple base-band solution for video input and output. MXF file transfers over Gigabit Ethernet open the door to new IP solutions for transferring video across the room—or across the country—at exceptionally low cost.

By using economical switches and computer-industry infrastructure, the Image Server's Gigabit Ethernet design enables low-cost networking of broadcast operations from ingest to storage, for editing, play-to-air, and archiving. The Image Server moves programs many times faster than real time, saving time and streamlining operations.

360 Systems' MXF implementation uses Operational Patterns 1a and 1b. It has been tested for compatibility with MXF files from many other manufacturers. 360 Systems can make Image Server MXF files available for testing and evaluation through our FTP Site. Contact the customer service department to arrange for access.

Reliability Counts

360 Systems has 34 years experience manufacturing equipment for television broadcast and other critical industries. We understand quality and reliability, and we've paid close attention to design issues like power, cooling, and protecting stored data. We've even included alarms on key server components.

Self-Mirroring Image Servers

When the very highest level of reliability is required, Image Servers are priced so attractively that it can even make good business sense to install them in redundant pairs. 360 Systems offers a **Dual Server Controller** that allows an automation system to transparently control a redundant pair of Image Servers in parallel. For more information on redundant servers, visit our web site at www.360systems.com or contact 360 Systems' Sales Department.



Key Features and Benefits

The Image Server is designed from the ground up to deliver outstanding performance and value in a multi-channel MPEG-2 and DV-format server. Three video outputs with analog, digital, and Gigabit Ethernet interfaces make it an excellent choice for the next-generation plant.

- MPEG-2: Main Profile @ Main Level and 4:2:2 Profile @ Main Level to 50 Mb/s.
- Optional import and playout of DV-format video and TARGA graphics files
- Drag-and-Drop FTP transfers from popular desktop editing programs
- Internal RAID-5 storage configurable to 170 hours
- Three simultaneous video outputs, 1 video input
- SDI *and* composite video inputs and outputs
- Includes balanced analog and AES/EBU digital audio ports as standard equipment
- Four audio channels (2 AES stereo pairs) for each video channel
- Embedded audio available as an option
- Serial control via VDCP, P2, or Odetics, AMX or Crestron protocol
- Compatible with leading broadcast automation systems
- Fast FTP network transfers on Gigabit Ethernet
- LTC Time code input and output; VITC written and read
- Frame-accurate head and tail trimming
- Advanced Playlisting: Build, edit, store, playback, and loop multiple lists
- Looping
- Closed-Captions
- Keyboard shortcuts speed editing tasks
- Set-up, administration and control via graphic user interface
- Remote GUI software for Windows available
- 32-character file names
- Compact 2RU (3½") [88mm] enclosure, low power consumption
- Low cost

Applications for 360 Systems' Image Servers

Image Servers add value to a wide variety of applications in broadcasting, cable distribution, video production, P-E-G, entertainment and sports venues. Many of these tasks are impractical with videotape because of its nature as a slow-response, single-channel device. In contrast, the video server provides immediate record and playback of any source, and lends a spontaneous appearance to broadcasts, presentations and live events.

- News Production – Promos, teasers, intros, news segments, graphics, animation
- Graphics Server – Play TARGA files with key-and-fill
- Master Control – Program and commercial playout, station IDs, promos, teasers
- Program Ingest – Automated capture of satellite, tape, microwave, and fiber feeds
- FTP File Delivery – Deliver news, promos, spots over DSL or ATM lines
- Play-to-Air Server – Playback under automation control
- Program Store-and-Forward – Temporary storage for subsequent delivery
- Commercial Insertion – Playout under automation control
- Instant Replay – Hot Key playback of sports plays, news clips, stills, and graphics
- Sports Shows and Events – Player bios, animations, graphics, promos
- Game Shows – Prizes, graphics, animations, promos
- Talk and Variety Shows – Promos, teasers, intros, outros, graphics, animations
- Award Shows – Nominees, categories, promos, graphics, animations
- Theme Parks and Casinos – Playout for show backgrounds, event lists, kiosks
- Houses of Worship – Projection displays, program production, broadcasting
- Colleges and Universities – On-campus networks, production, presentations
- Digital Signage – drive projectors, flat-panel displays, kiosks
- Entertainment Industry – Road show displays, projection
- Public Access, City Governments – Long recording times, high quality video
- Small & Mid Broadcast Markets – High performance at an attractive price



Available Models and Options

Image Server 2000 Model V2000-120

Provides 1-input, 3 outputs, MPEG-2 encoding to 50 Mb/sec, MXF network transfers, head and tail trimming, playlisting, (4) 120 GB drives in RAID-5 array provides 52 hours of storage at 12 Mb/sec.

Image Server 2000 Model V2000-250

As above, with 112 hours of storage at 12 Mb/sec

Image Server 2000 Model V2000-400

As above, with 170 hours of storage at 12 Mb/sec

DV and Graphics Option

Upgrades Image Server 2000 to include direct import of DV-format video and TARGA graphics files over Ethernet. Plays DV in native format and graphics with simultaneous key and fill. Direct FTP file import from Photoshop®, After Effects®, Final Cut Pro®, Xpress DV/Pro™, Liquid Edition, Vegas video. May be added to an existing Image Server.

Multi-Format Image Server Model V2000-MF-120

This Image Server includes direct import of DV-format video and TARGA graphics files over Ethernet. Plays DV in native format and graphics with simultaneous key and fill. Direct FTP file import from Photoshop®, After Effects®, Final Cut Pro®, Xpress DV/Pro™, Liquid Edition, Vegas video.

Multi-Format Image Server Model V2000-MF-250

As above, with 112 hours of storage at 12 Mb/sec

Multi-Format Image Server Model V2000-MF-400

As above, with 170 hours of storage at 12 Mb/sec

Embedded Audio Option

Upgrades Image Server 2000 or Multi-Format Image Server for operation with SDI embedded audio. Provides 4-channels, 48k sample rate, 20-bit resolution on input and all outputs. May be added in the field to servers with S/N after 300.

Advanced Playlisting Upgrade

Upgrades earlier Image Servers to provide Advanced Playlisting capability (standard in servers from May 2005).

Storage Upgrades

Upgrades any Image Server having small drives to provide either 112 or 400 hours of storage (at 12 Mb/sec). Field installable.

PAL Models

Add the suffix PAL to model number when ordering. Specify type of mains cord required.

Maintenance Spares

360 Systems' is committed to keeping your Image Server on air. The server contains hard disk drives and other fragile electronic devices; and while it is designed to be very reliable, having spare parts on hand in the event of a fault is a good practice. Hard disk spares are particularly important. Please consider these important options at the time of your purchase, or shortly after.

- 120 GB Image Server Hard Drive for 52-hour servers
- 250 GB Image Server Hard Drive for 112 hour servers
- 400 GB Image Server Hard Drive for 170 hour servers
- Image Server Power Supply, universal line voltage

Installation

Unpacking

Your Image Server has been carefully inspected and calibrated before shipment to allow immediate operation upon installation. Check all items for signs of visible damage which may have occurred during shipment. If any item is damaged, contact the carrier to file a claim.

Keep the packing materials in the event that a unit must be shipped by you. If the original packaging is not available, make sure that the following criteria are met:

- Packaging must be able to withstand the product weight.
- Product must be held firmly within the package.
- There must be at least two inches (50mm) of space between the product and outer container.
- The corners of the product must be protected.

Package Contents

Confirm that all items on the packing list have been received. Contact 360 Systems if any item is missing.

- ✓ Image Server
- ✓ Keyboard
- ✓ 2-Button Scroll Mouse.
- ✓ Software CD-ROM, backup copy
- ✓ Rack Mount Hardware Kit
- ✓ Operations Manual
- ✓ Quick Start Guide
- ✓ Audio Connector Labels
- ✓ Power cord
- ✓ Warranty Card

The Image Server is not shipped with a video monitor. You may select a VESA-compliant CRT or LCD monitor suitable for your application.

If you own more than one Image Server, it may be appropriate to use a single keyboard, monitor, and mouse with a KVM switch to select between servers.



Rack Mounting

Refer to instructions packaged with the Rack Mount Hardware Kit for specific installation information.

Note: If you plan to use digital audio, be sure to change the configuration of the Analog/Digital Audio Jumpers inside the unit before mounting the Image Server in a rack. The jumpers are factory set to the Analog audio position. For more information about changing the jumpers, see Analog/Digital Audio Selection on page 106.

There are four adhesive-backed rubber feet on the Image Server, which may be removed when rack mounting the unit.

Generally, the Image Server will be mounted in a 19" rack enclosure having 10-32 tapped holes. The Image Server can be adapted to rack enclosures having untapped round or square holes by using the nuts and washers included with the mounting kit.

Cables attached to the rear of the Image Server should be supported by the rack mounting rails. Do not support substantial cable weight from the Image Server.

Keep the air vent slots on the sides of the Image Server free of obstructions.

Remove the front panel to expose the rack screw slots. Fasten the Image Server into the rack using 10-32 flat-head Phillips screws (provided). Replace the front panel. Tighten the front panel access screws.

Important Information on Equipment Cooling

When many pieces of equipment are mounted in an equipment rack, a considerable amount of heat may be produced, which must be removed efficiently. Further, a lower operating temperature will make equipment operate more reliably, and it will last longer. In the extreme case, excessive temperatures cause rapid equipment failure, and damage which can be difficult to repair.

Heat in an equipment rack should be removed by forced air. This is often accomplished by blowers installed in the top of the rack, venting into the room. An alternative is to draw hot air from the top of the rack into an air-conditioning return duct, and not vent it into the equipment room; cold air should be ducted into the bottom of the rack.

The optimum air temperature for cooling electronic equipment is 25° C (72° F). When many pieces of equipment are contributing to the heat load, a substantial air-flow will be needed, and the inlet temperature may need to be lower.

Check These Points

- Are all ventilation holes in the Image Server free of obstruction?
- Can blowers or HVAC system adequately remove heat from the equipment rack?
- Have you measured the actual temperature inside the rack? Do this near the top.
- Verify that the HVAC system is not on a timer that can shut off on weekends or holidays.
- What procedures are in place to protect the equipment when the HVAC system fails?

Important Information on Power Conditioning

It is good practice to operate an on-air video server from an Uninterruptible Power Source, or UPS. All utility power systems experience occasional transient events, including brownouts and dropouts, which are capable of taking a server off the air. It is the station operator's job to plan for and overcome such contingencies.

UPS units suitable for smoothing short-term power line problems come in two varieties:

Change-over UPS Design

This design senses drop-outs and low-line voltage, and switches its output to an internal inverter operating from a battery. This UPS is low in cost, and is most often used in non-critical applications such as desk-top computers. A disadvantage is that it may create its own power transients when switching between utility power and its inverter supply.

Continuous Conversion UPS Design

This improved design continuously converts utility power to DC, stores it in a battery, then produces isolated AC power from an inverter. It never switches, and is immune to input transients, brownouts, and blackouts. Models are available with batteries of almost any size, making the continuous-conversion UPS suitable for transient suppression or long-term operating power the absence of utility power.

Recommended UPS Models

The following makes of continuous conversion UPS systems are suitable for use with 360 Systems' Image Server products:

- Eaton/Powerware Corporation, Model 9125, www.powerware.com

About Image Server Software

The Image Server is shipped with its operating system and application programs already installed.

The first time that it is started, it must be connected to a keyboard, monitor and mouse. The Image Server will ask you to accept the licensing agreement before it will allow any operation. This screen will only appear during the initial startup, or until accepted.

THE CD-ROM SUPPLIED IS ONLY FOR USE IN REINSTALLING THESE PROGRAMS. DO NOT LEAVE IT IN THE CD-ROM DRIVE.

If for any reason it becomes necessary to reinstall any software, refer to the *Maintenance* chapter for instructions.

The CD-ROM drive is intended only for installing software. It may not be used to load video or audio program content.

The Image Server Hardware Interface

Front Panel Features

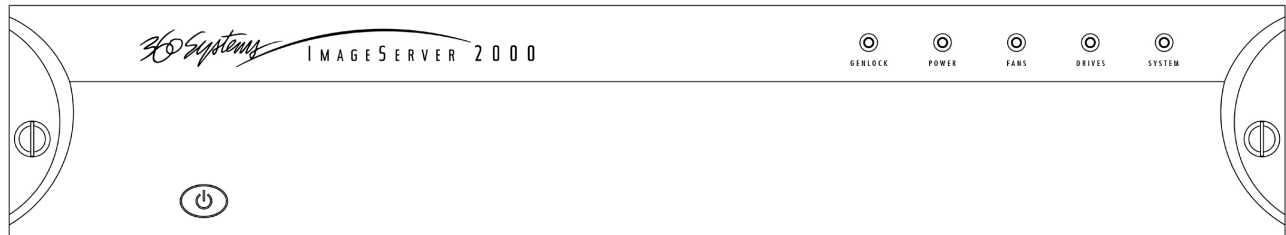


Figure 1: Image Server Front Panel

Power ON/OFF button

The blue front panel button initiates start-up and shut-down of the Image Server. Press it momentarily to start the server. A sequence of start-up screens will appear, ending with the 3-channel graphic user interface.

When the Image Server is running, pressing the blue button momentarily will cause the system to begin an orderly shutdown. In the event that the system has stopped responding to commands and will not shutdown, hold the button in for 4 seconds to force a power down.

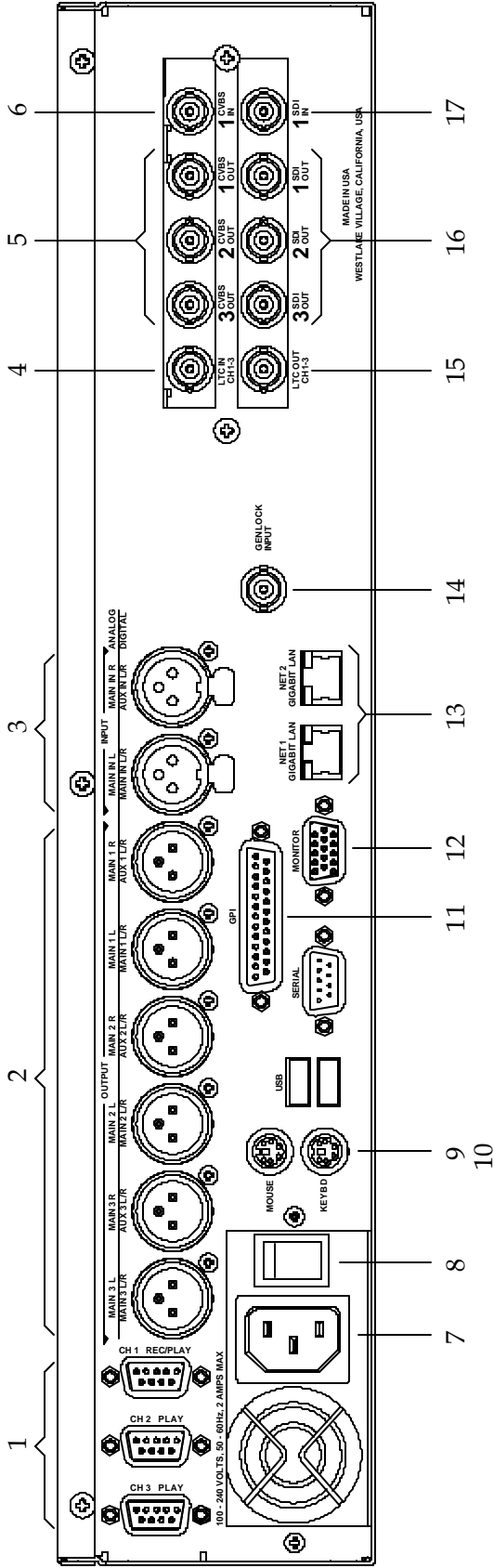
Do not use the rear panel switch on the power supply to shut down the Image Server. Abrupt power loss can cause loss of information stored on the disk array. See *Shutting Down Image Server* on page 27 for details.

Indicators

Five blue LED Status Indicators appear on the front panel. These indicators are illuminated continuously when the system is functioning normally. See the table *Front Panel Indicators* on page 102 for diagnostic meanings.

Rear Panel Drawing

FROM S/N 300



1. (3) serial control ports (EIA-422)
2. (6) XLR-3 audio outputs (AES/EBU digital or +4 balanced analog)
3. (2) XLR-3 audio inputs (AES/EBU digital or +4 balanced analog)
4. LTC time code input
5. (3) Composite video outputs
6. Composite video input
7. AC Power connector
8. AC Power switch
9. Mouse port
10. Keyboard port
11. GPI port, 25-pin female:
- (6) opto-isolated inputs, (6) status outputs
12. SVGA monitor port
13. (2) Gigabit Ethernet ports
14. Genlock Input
15. LTC time code output
16. (3) SDI video outputs
17. SDI video input

Figure 2: Rear Panel Features



Rear Panel Features

Video Inputs

The Image Server provides a single video input channel. This channel includes separate BNC inputs for serial digital ("SDI" per SMPTE 259M) and analog video (CVBS) signals. The graphic user interface allows selection between the two. Encoding to MPEG-2 format is performed within the server. Video inputs have a fixed 75-ohm termination.

Video Outputs

Video outputs are provided in SDI and Composite (CVBS) formats simultaneously. Digital video appears in SDI format at 270 Mb/s and conforms to SMPTE 259M. Analog video is in conventional composite (CVBS) format.

Video Output 1 can superimpose time code over picture as a "window burn" on NTSC models. This feature is available only on the CVBS video output, and is enabled through the On-Screen graphic user interface.

Audio I/O

The Image Server can provide audio inputs and outputs in three formats:

- Balanced analog audio at the industry-standard reference level of +4 dBu.
- Digital audio in AES/EBU format per AES-3-2000.
- SDI embedded audio, 4-channels (server option)

These multiple standards facilitate the transition from an analog studio to digital production and broadcasting, and ensures that the server can operate with virtually any external equipment. Note that both *analog and AES/EBU audio signals are not available at the same time* on a given input or output. Internal jumpers select between analog or digital; however, input and output can be set up differently, if desired. A set of XLR-3 connectors allows high-quality connections to be made in either format. Embedded audio, when installed as a server option, appears in the SDI output at all times.

Analog Audio Capability

When the analog audio input format is selected, each video channel has two audio channels, recorded together as a stereo pair. Trimmers allow adjustment to unity gain.

Digital Audio Capability

When AES/EBU digital audio is selected, each video channel has four audio channels, which are recorded as two stereo pairs. Because a single XLR connector carries a *stereo pair* in digital format, and only one (mono) channel in analog, the server provides an extra pair of audio channels when used with digital audio signals.

Embedded Audio Capability

When SDI embedded audio is selected, four audio channels are available for recording. Embedded audio is always present in the video outputs. Note that discrete audio (analog or AES/EBU) is also available on XLR connectors, at the same time embedded audio appears in the video stream. Embedded audio has a 20-bit resolution.

Audio Word Size and Sample Rate

The Image Server employs 24-bit audio A/D and D/A converters, and records audio into a 24-bit frame, regardless of the word size received. The sample rate is fixed at 48K.

Analog/Digital Audio Selection

The following drawing illustrates jumper positions to select between analog or digital audio. Note that each output may be individually selected. As described earlier, when analog audio is selected, only *two channels* are available, while selection of AES/EBU digital audio provides two *stereo pairs*, one on each XLR connector. Both jumpers for each channel (Left & Right, or Main & Aux) must be set together, either analog or digital. The Image Server must be power cycled for jumper changes to take effect. For more detail, see *Analog/Digital Audio Selection* in the *Maintenance* chapter.

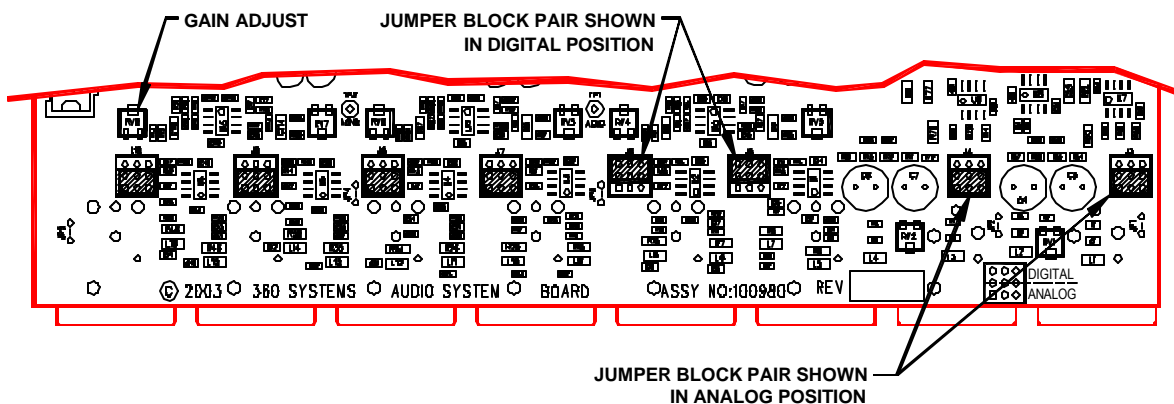


Figure 3: Jumper location on audio card for selection of analog or digital audio.

Audio Format Labels

A sheet of labels is supplied with each server for identifying the audio connector configuration on the rear panel. After the jumpers are set, apply appropriate “Analog” or “Digital” labels above the corresponding connectors on the rear edge of the top cover.

Serial Control Ports

Each of the Image Server’s three 9-pin “D” connectors permits independent control of any of the three video channels. They can accept serial commands in VDCP, P2, Odetics, AMX or Crestron protocol. Its multiple serial ports allow you to simultaneously connect an automation controller and a desktop controller. See the chapter on Automation Control for more detail on this subject.



Most broadcast automation systems, and some remote control panels employ the VDCP protocol. A detailed list of supported VDCP commands will be found in *Appendix B*.

Many controllers used for transport, instant replay, and edit control employ P2 or Odetics protocol. The Image Server P2 protocol emulates BVW-series tape machines. Many Pro-AV systems employ AMX and Crestron protocol.

Gigabit Ethernet Ports

Two Gigabit Ethernet ports are provided on the Image Server. The NET 1 port is intended for network transfer of program content between video servers. The server supports MXF file transfer (MPEG-2, Op 1a and 1b), which allows content interchange between products from different manufacturers, as well as file import in various formats from desktop editors. The NET 2 port is reserved for data transfer between two Image Servers, when configured for redundant operation.

GPI Control

The Image Server provides six GPI inputs for control of machine functions, which appear on the 25-pin **GPI** connector. This “General Purpose Interface” can be connected to switch contacts or an open-collector transistor output. GPI inputs are programmable, and can provide machine control such as PLAY, STOP, or RECORD through simple external switches.

The Image Server also provides six GPI status outputs which may be used to confirm that a command has been received, or for other purposes. These functions of these open-collector outputs are programmable, and may be used to operate an LED, or they can be connected to a suitable logic input. The pin-out for the GPI connector will be found in *Connector Specifications*.

Genlock Sync Reference

A BNC connector is provided on the rear panel to receive a genlock signal. During normal operation, the Image Server should be referenced to an external genlock reference in the form of CVBS Black. As with all video systems, this server and equipment connected to it must be referenced to a common genlock source. The **GENLOCK** input provides a fixed 75-ohm termination.

An internal crystal reference is also provided so that the server can be used as a stand-alone player, and also for convenience in performing tests in the laboratory. Use particular care when operating the server with an internal reference, as synchronization with other equipment is not possible. Additionally, recording is not allowed when using the internal crystal.

Genlock Signal Quality

A genlock signal connected to the Image Server must conform to the RS-170A standard. PLL circuits used within the server remove residual jitter from the genlock signal. This may preclude the use of low-cost VTRs that introduce time instability (wow) into their output, making them inaccurate as a genlock input source.

LTC Time Code Input

A LTC time code input is provided on the **LTC IN** BNC connector. This input may be selected by means of the On-Screen user interface and recorded as a time code reference. The LTC input provides a >10k ohm termination.

LTC Time Code Output

An LTC time code output is provided on the **LTC OUT** BNC connector. It may be selected by means of the On-Screen user interface to output time code from any of the three video channels during playback. The LTC output has a low source impedance of <5 ohms.

Keyboard

Attach the alphanumeric keyboard to the purple 5-pin **KEYBD** connector to control the server and manage clips with the On-Screen graphic user interface. Note that the server will only recognize the keyboard if it is attached before power up.

Mouse

A two-button scroll mouse is provided with the Image Server. Plug the mouse into the green 5-pin **MOUSE** port. Note that the server will only recognize the mouse if it is attached before power up.

Monitor

A VESA-compliant computer monitor may be connected to the 15-pin VGA video port. The Image Server resolution is fixed at 1024 x 768 pixels, with a refresh rate of 72 Hz. This is best-viewed on 17-inch or larger monitors. 360 Systems does not provide monitors for the server. Note: Do not use older monitors that do not state they are VESA compliant.

Serial Port

The system board serial port is not used. Make no connection.

USB Ports

The system board USB ports are not used. Make no connection.

Power

An IEC mains socket is provided on the rear panel for power input. The Image Server will accept worldwide power sources in the range of 100-240 volts AC, 50-60 Hz. The server is shipped with a power cord appropriate for the region in which it is sold. Replace the power cord only with one of the same type and rating.



DO NOT use the power supply switch to shutdown the Image Server. Shutdown the system only by momentarily pressing the front panel power button, or through the SHUTDOWN command on the On-Screen user interface. The rear panel power switch should only be used if the Image Server fails to shutdown after holding the front panel power switch for 4 seconds.

The server may also be shut down from the graphic user interface. Click START > SHUTDOWN > SHUTDOWN. After a few seconds, shutdown will occur.

Basic Operations

This section introduces the Image Server Graphic user Interface (GUI), its menus and its operating controls. If you want to skip ahead to learn how to record a clip, go to page 40. Skip to page 42 to read about playing a clip.

360 Systems has designed the graphic user interface as a convenient way to manage Image Server operations. With it, you can control basic operations such as recording and playout. You may also set up video and audio formats, assign remote control channels to video ports, and set up many other aspects of the machine.

All GUI software is pre-installed on the Image Server. It is also provided on the Image Server software installation CD-ROM. The GUI is operated with a keyboard, mouse, and monitor connected to the Image Server rear panel. Attach these devices only when power is turned OFF.

The Image Server Desktop

The Image Server desktop is similar to many computer system graphic interfaces. There is a task bar and start menu at the bottom of the screen. The Image Server desktop is always running while the machine is on. Use the Start menu button to launch applications, manage the system, or to shutdown the server.

Launching the Graphic User Interface

The GUI appears automatically during boot up. If On-Screen has been closed, click **Start**, then **Image Server GUI** to re-launch the GUI. It will then appear and fill the screen. The window can then be moved, minimized, or closed as desired.

Shutting Down Image Server

Click **Start**, then **Shutdown**, then either **Shutdown** to begin an orderly shutdown, or **Full Restart** to do an orderly shutdown and Restart.

Alternatively, momentarily pressing the front panel power button will cause the system to begin an orderly shutdown. Image Server will acknowledge the button press with an audible beep and the front panel lights will begin to flash together. Any operation in progress will be halted, and any unsaved work will be lost.

In the event that the system has stopped responding to commands and will not reset by pressing the front panel button (no beep is heard), press and hold the button for about 4 seconds to force a power down. Wait 5 seconds, and then the system may be restarted with another press of this button.

DO NOT use the rear panel power supply switch to shutdown the Image Server. Doing so may cause loss of unsaved data, and may require the RAID array to re-synchronize – a process



that could take several hours. Shutdown the system *only* by momentarily pressing the front panel power button, or through the GUI.

Keyboard Shortcuts

Most operations the graphic user interface can be performed using keyboard shortcuts. See the list of keyboard shortcuts in Appendix C.

On-Screen Main Menu Bar

The main menu bar contains the following headings and sub-menus. Each menu choice is explained in detail in a later section.

File	Transport	Configure	Window	Help
Exit	Channel 1 > Channel 2 > Channel 3 >	System... Options... Date/Time... Channel 1... Channel 2... Channel 3...	Cascade Tile Close All Clip List	About

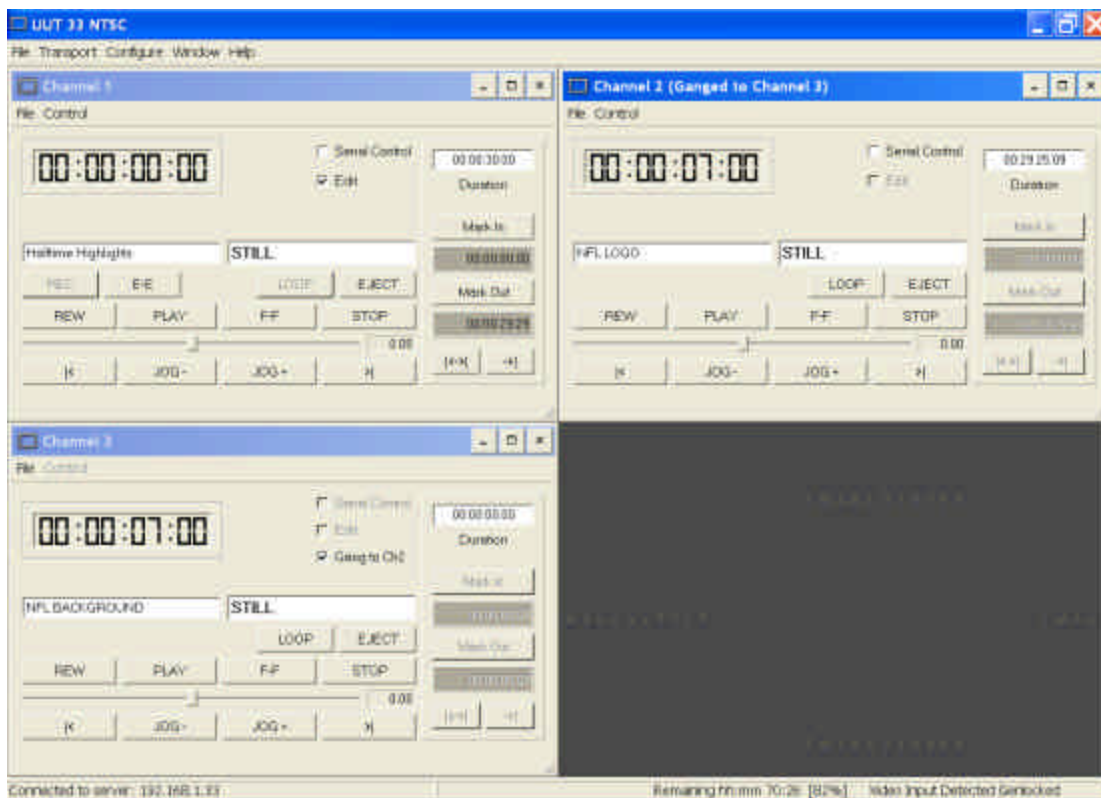


Figure 4: Graphic User Interface with Clip Transport Windows

File

The **File** menu provides access to the **Exit** command.

Exit

Exits the GUI.

Transport

Select a video channel from the dropdown menu, then select **Clip...** or **Playlist...** to bring up the GUI control panel for that channel.

Clip

Open this window to play, edit, and perform file operations on individual clips. A full set of transport controls are available in this mode.

Playlist

Build, edit, manage and play playlists. These operations are described in detail in the *Playlist* chapter.

Configuring the Image Server

All user-configurable aspects of the Image Server are grouped below this menu.

System

Open this dialog window to configure general control and sync parameters, such as GPI, sync, time code, and video standard. See *System Configuration* on page 75 for more information.

Date/Time

Open this dialog window to set the Image Server's internal system date and time. This information will be used to time stamp the data files of new recordings.

Channels

Select a video channel from this dropdown menu to configure channel-specific audio, video, and time code parameters. For more information about changing channel setups, see *Channel Configuration* on page 82.

Window Arrangement

Choices in this menu change the way the GUI windows are displayed. Use the **CTRL+TAB** key combination to change the active GUI window in rotation, or use the mouse to activate another window.

**Cascade**

Arranges all open windows so that they are overlapping, but offset. This choice is especially useful with small monitors or low-resolution monitors.

Tile

Arranges all open windows so that each is fully visible at the same time. This choice is especially useful with larger monitors.

Close All

Closes all open windows. Note: Transport windows must be in the idle state to close.

Clip List

Opens a window containing all available clips on the Image Server. When in Playlist mode, with the Edit Box checked, files may be dragged and dropped from Clip List window into the Playlist window.

About

Displays the Image Server software version.

Clip Transport Window

The graphic user interface is used to control transport operations such as play, stop, record, and basic head and tail trimming. These functions are found in the Clip Transport window for each channel. Channel 1 is both a Record and Play channel, while channels 2 and 3 are playout only. Each transport window has its own file menu, which is used to locate and play existing clips, or to create new clips. (Refer to Figure 5, below.) The graphical layout is similar for each channel, except that only Channel 1 also contains Record and E-E buttons.

From the main menu bar, select **Transport**, then select the channel number to be controlled. From the dropdown menu, select **Clip** or **Playlist**. Up to three Channel Transport Windows may be opened at once, one per server channel. The **Window** menu may be used to arrange the channel windows on the screen. Windows may also be arranged manually by using the mouse and standard window sizing controls.

The server will establish a connection to control the channel when its channel window is opened. A message, "Connected to host" should appear in the bottom status bar of the main window. If the Image Server program has not started because the system is busy, the message "Connection to Host Refused" will appear. This is usually a temporary condition that will resolve itself without intervention.

Each Clip Transport window includes a main menu bar, status bar, current clip name, a large current time code display, and the standard transport controls PLAY, STOP, FAST FORWARD, REWIND, LOOP, EJECT and a shuttle slider. Channel 1 also provides REC and E-E.

A number of direct-action buttons are also provided: Go To Head Point (|<-), Go To Tail Point (->|), JOG+ and JOG-. An edit region provides Mark In and Mark Out entry buttons, and time code displays reflecting these positions. Review Clip (|<->|) and Review Out (->|) buttons provide a means to audition an entire edited clip, or just its ending.

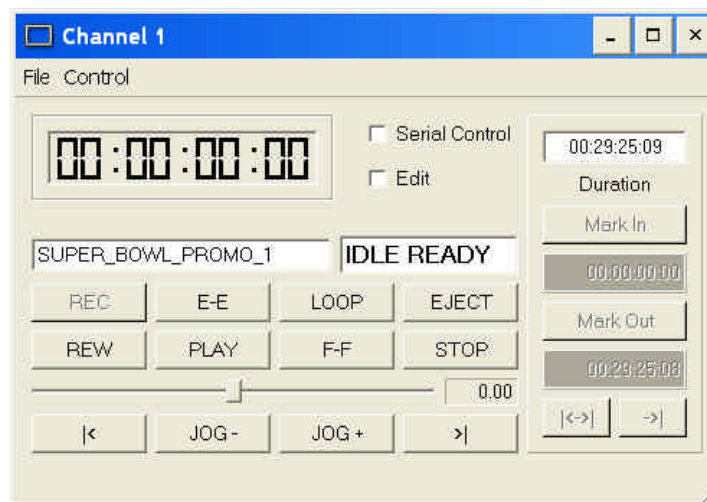


Figure 5: Channel Transport Window

Menus

The following headings describe each clip window **File** menu:

File

The **File** menu provides six file-management choices. Columns can be sorted in ascending or descending order by clicking the column header bar to toggle the setting.

New

The recording process begins with naming the new clip. The **New** menu choice opens a dialog box in which a new clip may be named (Figure 4). Clip names can include any alphanumeric ASCII character, up to 32 characters.

Note: File naming is case sensitive. Upper case letters sort before lower case. The name *FILE* sorts in the order shown, based on differing capitalization: *FILE*, *File*, *file*, and *file*.

The file dialog box includes an advisory message labeled **PERCENT DISK FULL**. When this figure becomes high, it is wise to consider deleting unnecessary files from the drive.

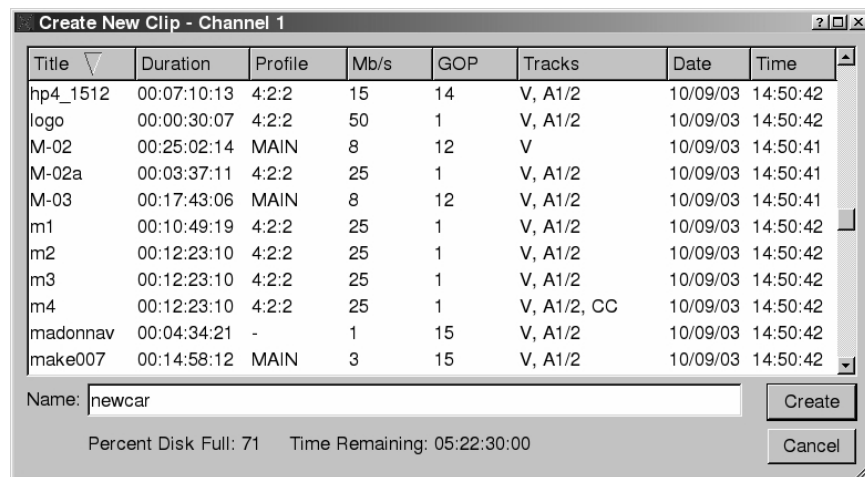


Figure 6: File Dialog Box

After entering a clip name, choose **Create** to create a new clip file. The Image Server will place itself in Record-Ready mode. If the server was previously in the Play-Ready mode, a brief pause will occur. The channel status message will report "Ready" and the **REC** button will become functional.

Refer to the following main section titled Recording for more information on setting up and making recordings.

Open

In the Play-Ready mode, the **Open** command presents a window from which a clip may be selected (Figure 7). A new selection closes the previously open clip, and the newly selected clip becomes ready for playout or trimming.

Refer to the following main section titled Playing a Clip for more information on that subject.

Column headings in the file dialog box are: Title, Duration, Profile, Mb/s, GOP, and Tracks. Click on the column heading to sort the list by that column. Click on the selected heading again to reverse the sort order.

Most headings are self-explanatory. GOP is Group of Pictures length in frames. If the GOP listing is 1, then the clip has only one frame per GOP (I-frame only). The Tracks column lists the type of tracks associated with each clip. Clips may have any of the following track attributes, depending on how they were recorded.

Track Attribute	Recorded Track
V	Video
A 1/2	Audio Tracks 1 & 2
A 3/4	Audio Tracks 3 & 4
CC	Closed Caption

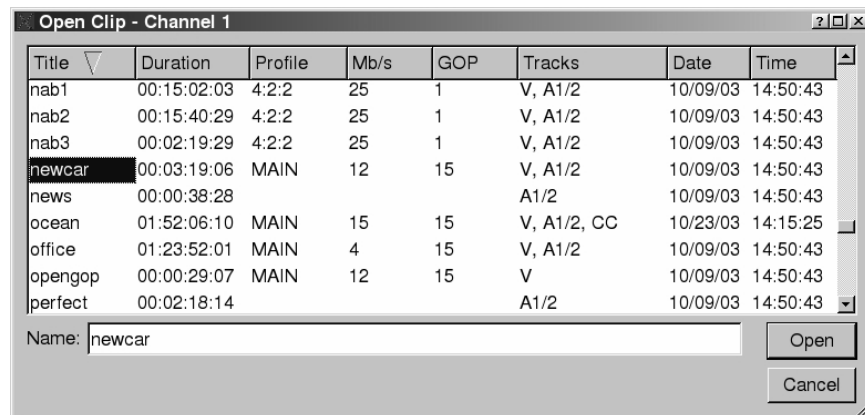


Figure 7: Selecting a Clip to Open

Save

The **Save** command saves a clip, including any new head trim or tail trim settings associated with it. Any operation, such as **Exit**, that would cause new edits to be discarded will prompt the user to confirm a save of those trims.

Save As

A region defined by Mark-In and Mark-Out may be saved as a new clip with a unique name. Use the **Save As** button for this purpose. A dialog box will appear with a prompt to enter a clip name. After entering the name, click **Save As** again to save the clip with a new name. When using **Save As** it is a good practice to give new sub-clips a name related to the original.

A clip consists of audio/video data and related attributes. The attributes include the current starting and ending points – the In and Out edit points.

When a copy of a clip is made using the **Save As** feature, only the In and Out edit points are actually copied to the new clip. The base audio/video data is shared among all copies. In this way, each copy may have different In/Out Points without using additional disk space to duplicate the audio/video data. Additionally, the In and Out Points can be adjusted later to any position within the original recorded material.

Clips created with the **Save As** feature are noted in the File List as having a duration equal to their play time, as defined by the In and Out-Marks. The sum of these durations may far exceed the anticipated recording time available on the disk array. However, these “virtual files” take no disk space. Refer to the *Percent Disk Full* and *Time Remaining* estimation in the **File > New...** dialog box, or at the bottom right of the main application window. The Record Time Remaining estimate is based primarily on the *current* record configuration bit rate, the number of audio tracks selected, and the available disk space.

Another important concept is that there is no parent-child relationship among clips. The original clip name may be deleted without affecting any clip created by using **Save As**. Renaming clips will never cause the Image Server to lose track of its relationship to the original recorded data. The original recording will remain on the disk as long as there is at least one clip file pointing to it. The original recording will be automatically deleted when the last clip associated with it is deleted. Deleting all related clips is the only way to free disk space.

Rename

Rename is a drop-down selection under File, allowing a new or more useful name to be applied to an existing clip (Figure 8). Select **Rename**, and then within the window, select the file to be renamed. Type a new name in the **Rename** window, then click the **Rename** button. The old file name will be replaced with the new one.

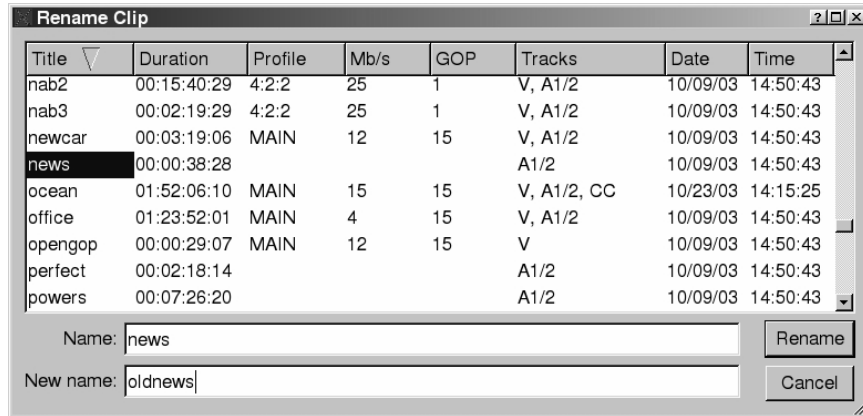


Figure 8: Renaming a Clip

Delete

One or more files may be deleted at once with the Delete command. There are four ways to tag files for deletion:

Using the left mouse button highlight a file in the Files window, then press the Delete key.

Select a file to be deleted using the left mouse button. While holding the mouse button down, drag the mouse through other sequential files, highlighting all for deletion. Then press Delete.

Select the first file in a sequential list of files to be deleted. Press and hold the Shift key, then click on the last file in the list to be deleted. The selected list will appear highlighted and all may be deleted with a single stroke of the Delete key.

While holding the Control (Ctrl) key down, click to select any number of files (in any order) to be tagged for deletion, then press Delete.

Note: The Ctrl key is a toggle selector, and may be used to de-select files that were accidentally highlighted. This is also useful in combination with the Shift key. A large block may be highlighted using the Shift key, then use the Ctrl key and mouse to de-select individual files from within the highlighted list. The Ctrl key may also be used to add additional files to the block created with the Shift selection method.

Exit

Exit will close the current Channel window. On exiting, the user will be prompted to save a recording if the file or its edits are new. Exit is grayed-out when Record or Edit operations are currently in progress.

The Status Bar

A status bar appears at the bottom of the window that provides system information to the user including GENLOCK, INPUT VIDEO DETECTED, and TIME REMAINING—PERCENT FULL. Messages such as CONNECTED TO HOST or CONNECTION TO HOST REFUSED are also displayed to help diagnose problems.



Transport Controls

The clip window button functions are common to both recording and playing a clip. This section introduces the buttons by function. See *Recording* on page 40, and *Playing a Clip* on page 42 for relevant procedures.

Serial Control

Select the **Serial Control** check box to control the channel through the serial control ports (VDCP, P2, or Odetics protocol). The GUI can take control of a channel at any time by de-selecting the **Serial Control** check box. Return control to the remote controller by re-checking **Serial Control**. If a remote controller is operating on the channel, de-selecting **Serial Control** will allow the GUI to assume control of the channel and remote commands will be ignored. Closing the channel window saves the **Serial Control** setting in the last-selected state.

NOTE 1: When the Channel is under **Serial Control**, the Transport window will continue to display current activity.

NOTE 2: Some remote controllers may need to be reinitialized to restore proper operation after **Serial Control** released then reselected.

Current Time Code Display

A large Time Code display indicates the current position in the active clip, measured from the Mark In point. When a clip is loaded to play, it will be cued at the Mark In point, which may also be the SOM if no Mark In point has been set.

If Edit mode is entered, the clip will cue to the SOM. The time code display then shows the current position, measured from the SOM.

Current Clip Name

This window, below the main Time Code Display, shows the name of the currently loaded clip.

Channel Status Display

Located next to the clip name window, the Status Display reports the current state of the transport: Stopped, Playing, Ready, Recording, Variplay, Busy, Cueing, Still, and Idle.

Record Button

The Record function is available only on Channel 1. It is disabled in Play mode. The Record button becomes active after a new clip has been named under the **File>New** dialog. Click on **REC** to initiate a recording. The button is illuminated red when recording.

A brief pause will occur when Channel 1 is switched between Play-Ready and Record-Ready modes. The status display will report "Ready" when the new mode is available.

NOTE 1: An external genlock signal must be connected to the server to make recordings.

NOTE 2: The maximum recording time is about 12 hours. The Image Server will stop recording and save the file at that time.

Play Button

The **Play** function becomes available after a clip has been loaded for playback. The **Play** button initiates playback at 1x speed.

Looping

A LOOP button appears in each channel transport window. This alternate-action button causes a clip to repeat continuously. Loop is a feature that can be turned ON or OFF at any time. It can be left ON during off-speed play or editing without any effect. Loop only works when the button is ON and the clip plays at 1x for at least 10 frames before the Out Point. Playing a loop must be initiated with the PLAY button.

Disengaging LOOP while a clip is playing will let it play to its end point, then stop. Use the STOP button to stop the clip immediately.

Loop can be very useful when doing voice-overs, dialog dubbing, creating bugs, or logo animations. Loops of scenes with similar-looking beginnings and endings can be edited to appear nearly seamless.

Eject Button

Eject unloads a clip. Playback, recording, or any other transport operation is terminated. Video will go to black. The clip is cleared from the channel. It is not necessary to eject a clip before loading another.

Stop Button (Still)

Stop pauses the current clip during Play, Fast-Forward, or Rewind. Video appears as a still frame. Click Play, FF, Rew, Jog, GoTo, or Shuttle to continue from the current position.

E-E Mode

This button appears only in the Channel 1 Record/Play window. Prior to recording, it is useful to monitor a signal to be recorded, but from the server's output. The term "E-E" (E-to-E) refers to an electrical path through the server, from input to output connector, without going to disk. E-E Mode toggles automatically as described below, but can also be switched manually at any time.

When a new clip is created for recording, the E-E input monitor is automatically switched ON. When a clip is opened for play on Channel 1, E-E monitoring is automatically switched OFF.

When Channel 1 is switched to playlist mode, the E-E monitor is automatically switched OFF. E-E mode cannot be toggled while the channel is in playlist mode.

When E-E is ON, the input video signal is routed to the CVBS and SDI outputs of Channel 1. Manually toggle the E-E mode button OFF to switch the output to the disk, for conventional playback operation.

Under automation control, Auto E-E behavior is slightly different than under GUI control. The server will remain in E-E ON mode until a transport control command (Play, Stop, Jog, etc) is received. After receiving such a command, the server will remain in E-E OFF mode until the clip is ejected, a new clip is loaded, or record mode is entered. In record mode, E-E



mode is ON. As with GUI operation, automation controllers may send E-E ON and E-E OFF commands to override the automatic operation.

Fast Forward / Rewind Buttons

Fast Forward and Rewind buttons move the transport at high speed in the chosen direction. Four speed choices are available in each direction. Click the button repeatedly for: 4x, 16x, 64x, and 128x. Audio does not play at these speeds.

Shuttle

The Shuttle control is a slider bar where the center detent represents 0 speed, or Still. The right and left extents of the slider represent $\pm 2x$ maximums. There are intermediate detents in each direction, representing a linear scale with 0.1x increments. A display next to the slider shows the numerical speed value.

This control plays the current clip in varispeed mode from 0 to $\pm 2x$ (including a detent at $\pm 1x$). Because the shuttle control uses varispeed algorithms, even 1x varispeed may appear to occasionally skip frames.

The Shuttle control slider works in three basic ways: Snap-Back to still, Hold Speed, and Mouse Wheel.

- In Snap-Back operation, click and drag the slide control to change speed. Releasing the slider bar will let it snap back to zero speed, or still.
- For Hold Speed operation, position the cursor over the slider control scale (not the slider arrow) and click the left mouse button to increment the speed control. The transport will run in the selected direction at the selected speed without holding the mouse button down. The cursor may now be moved over the Stop button to wait for the desired point.
- When using a scroll mouse, position the cursor over the slider scale and rotate the wheel to increment speed. Rolling the wheel in opposite directions changes the direction the arrow slider moves. To stop video, click the Stop button or the arrow slider.

Jog Buttons

The **JOG +** command will move to the next frame and go to Still. The **JOG -** command will move to the previous frame and go to Still.

GoTo Buttons

In Edit mode, click the arrows (**|<**, **>|**) to go to the next trim point (Mark In or Mark Out) in the selected direction. An additional click in the selected direction will go to SOM or EOM.

In Play mode, click **|<** or **>|** to go to Mark In and Mark Out points within the clip.

Keyboard Shortcuts

Many transport control and edit related functions can be performed by keyboard commands. A complete list of these appears in Appendix C.

Recording

Video recordings are made on the Image Server using the Channel 1 section of the graphic user interface, or an external automation system. Channel 1 can also be used for playback when not recording.

Setting up to Record

Image Servers were designed for use in genlocked facilities. Both the server and video sources feeding it must be referenced to a common sync reference. This signal should conform to RS-170 (composite video, black). When a genlocked source is not available, as in the case of satellite receivers or non-professional tape machines, a frame synchronizer can be used to create a synchronous source.¹ Alternatively, the video output of a stable source can be connected to a distribution amplifier and applied both to the server genlock input and to its video input.

Several steps must be taken before making a recording on the Image Server:

1. A genlock signal *must* be applied to the rear panel **Genlock** connector. The server *will not* enter record mode if it does not detect the presence of a genlock signal. The genlock input has a fixed 75-ohm termination. Do not add another termination at any point on the genlock cable.
2. The external genlock signal must be selected as the sync reference, using the On-Screen user interface.
 - A. When working from the Serial Inputs, check the box marked **SERIAL CONTROL**.
 - B. Eject any clip in Channel 1 and verify that the status window displays IDLE.
 - C. From the main menu bar select **CONFIGURE>SYSTEM**.
 - D. Select **GENLOCK** as the sync source.
 - E. Click **APPLY** followed by **OK**. The Configure window will close.
 - F. Check that the front panel **GENLOCK** LED is now illuminated.

Note: The **INTERNAL** sync reference setting (a crystal) can be used for playback, but not for recording.

3. A genlock signal must also be connected to equipment originating the video signal to be recorded on the Image Server. (See introductory paragraph of this section if there is no provision for a genlock signal.)

¹ Video frame synchronizers are available from a number of manufacturers from about \$800.



4. The Image Server can accept a video signal at either its composite video input, or its serial digital (SDI) input. Verify that the input to be used is currently active. This selection is performed from the Configuration option on the Main Menu bar.
 - A. Select **CONFIGURE > CHANNEL 1...**
 - B. On the Configuration screen that appears, select **COMPOSITE** or **SDI**.
 - C. Click on **APPLY** or **OK** to confirm the selection and close the window.

5. The Image Server records either two or four audio tracks according to a selection made in the Channel 1 Configuration window. When a selection is made it will be saved for future recordings.
 - A. Select **CONFIGURE > CHANNEL 1...**
 - B. On the Configuration screen that appears, select **AUDIO 1-2**, and/or **AUDIO 3-4**, or none if you do not wish to include an audio track.
 - C. Click on **APPLY** or **OK** to confirm the selection and close the window.

6. The Channel 1 configuration screen provides a number of other choices you may also wish to consider before making a recording. These include:
 - A. Select **CONFIGURE > CHANNEL 1...**
 - B. On the Configuration screen that appears, select **CVBS / Discrete Audio**, or **SDI / Discrete Audio**, or **SDI / Embedded Audio**.
 - C. Click on **APPLY** or **OK** to confirm the selection and close the window.

These topics are covered in detail in the System Configuration chapter of this book.

Making a Recording

When the steps outlined in "Setting up for Recording" (above) have been done, you are ready to record. Channel 1 can be used for recording or playback, but not both at the same time. Before making a recording, channel 1 must first be placed in the Record Ready mode, which takes two seconds. Once ready, any number of recordings can be made with no further delays.

Perform the following steps to enter Record Ready and make a recording:

1. When working from the On-Screen user interface, un-check the box marked **Serial Control**. When using an automation controller or other RS-422 external controller, check the **Serial Control** box.
2. Open the Channel 1 transport window. From the main menu bar, click **TRANSPORT > CHANNEL 1**, followed by **CLIP**. This window contains all controls needed to make a recording.
3. From the Channel 1 transport window click **FILE > NEW**. A dialog box will open prompting you to name the new recording before making it. In the lower window, enter the name you wish to give it, using up to 32 characters. Spaces may be used; however, characters *other than* upper or lower case letters and numbers (i.e. @#\$%&*) may not be used. A list of existing clips will appear in the large window, and can be used as a name reference when creating new clip names.

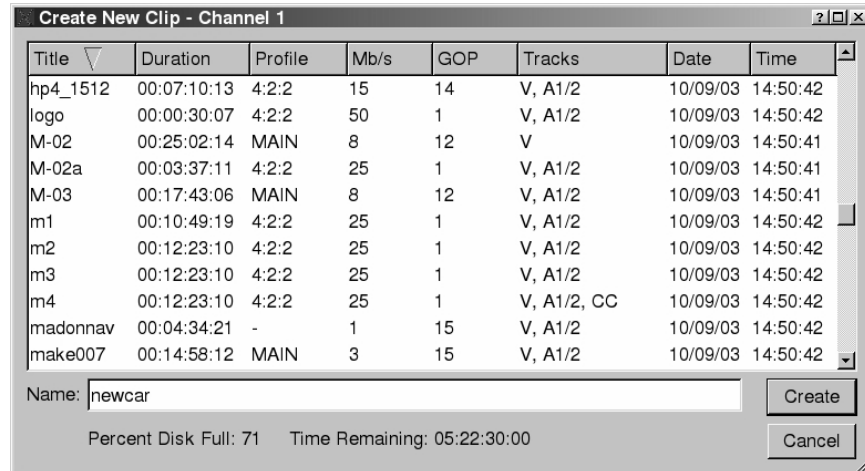


Figure 9: File Dialog Box

4. After a brief pause, the time code digits will appear and the server is in Record Ready mode. A recording can be started without further delay.
5. Click the **RECORD** button. It will turn red while recording.
6. Click **STOP** when complete.
7. The server will remain in Record Ready mode, and additional recordings can be made immediately by following steps 3 through 6.

If the server is available for use as an ingest station, two methods are available for auditioning a new recording:

- Channel 1 can play the recording immediately after it is made, but not during the recording process. This approach is valuable if Channels 2 and 3 are in use for another purpose.
- If Channel 2 or 3 is available, it can be used to play the recording while it is being made. A short delay is required before a clip being recorded becomes available for playback.

Notes:

The maximum recording time for clips is about 12 hours. The Image Server will stop recording and save the file at that time.

If an error that would corrupt the clip is detected during recording, the Image Server will terminate the recording operation. The clip will be saved, and will contain all material up to the point of corruption.

Do not change the record configuration (bit rate, GOP structure, number of audio channels, etc) after a new clip is named and ready to record. The configuration changes will NOT be applied to the cued recording. Set up the record configuration before naming the recording.



Playing a Clip

Clips can be played on any of the three channels of the Image Server , except that when Channel 1 is used for recording, it is not also available for playback.

Setting up for Playback

The Image Server was designed primarily for use in genlocked broadcast facilities. Both the server and video equipment following it should be referenced to a common genlock source. This signal should conform to RS-170 (composite video, black). However, if the server is being used for playback in a non-genlocked facility, its internal sync reference may be selected.

Perform the following steps before playing clips from the Image Server:

1. If a genlock signal is distributed through the facility, it should also be connected to the server's rear panel genlock connector. This input has a fixed 75-ohm termination. Do not add another termination at any point on the genlock cable.
2. If an external genlock signal is available, it should be selected as the server sync reference, using the graphic user interface.
 - A. When working from the GUI, un-check the box marked **SERIAL CONTROL**.
 - B. Eject any clip in Channel 1 and verify that the status windows displays IDLE.
 - C. From the main menu bar select **CONFIGURE > SYSTEM**.
 - D. Select **GENLOCK** as the sync source.
 - E. Click **APPLY** followed by **OK**. The Configure window will close.
 - F. Check that the front panel **GENLOCK** LED is now illuminated.
3. If the server is installed in a facility where no genlock signal is available, the Internal Sync reference setting can be used for playback without genlock. Follow the steps in item #2 above, but select **INTERNAL** instead of **GENLOCK**. In this case the front panel **GENLOCK** LED will not illuminate. Note that recording is not possible using the internal crystal as a sync reference.

Playing a Clip

When the steps outlined above in "Setting up for Playback" have been done, you are ready to play stored video clips.

1. When working from the serial interface or automation controller, check the box marked **SERIAL CONTROL**.
2. Open a Channel transport window. From the main menu bar, click **TRANSPORT > CHANNEL 1**, followed by **CLIP**. This window contains all controls needed to play a clip.
3. From a Channel transport window click **FILE > OPEN**. A dialog box will open containing a list of existing clips. Click on the desired clip name, followed by **OPEN**.
4. The dialog box will close, and the channel transport window will show the selected clip name and running time.

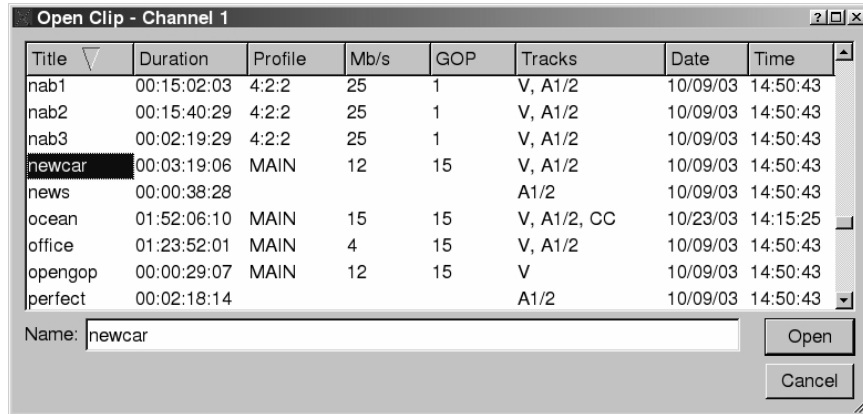


Figure 10: Selecting a Clip to Open

5. Click **PLAY** to play the clip.
6. Click **STOP** at any time.
7. Additional clips can be played by following steps 3 through 5.

Additional channel transport windows can be opened, and multiple clips can be played at the same time.



Editing a Clip

The edit controls are activated with the **Edit** check box. This region contains a number of buttons that define the beginning and end of a selected region, plus their associated time code displays.

Non-destructive Mark In and Mark Out trim points can be set to define a portion of the clip to be played. These “pointers” do not create a new clip from the original material; they act like virtual trims, and material outside of the trim points is excluded, but can be retrieved by resetting the Mark points. After setting the Mark In and Mark Out points, clips will play between these points. These values are saved with the clip.

Edits may be saved to the current clip by de-selecting the **Edit** check box, or choosing **Save** from the clip window **File** menu. **Save As** works to save the edit points to a new clip name, even if the edits have not been saved in the current clip. This is a great help while conducting an Edit-while-Recording.

Edit-while-Recording

While clips may be edited after recording is complete, it is often desirable to create sub-clips while the recording is still in progress. This is the preferred way to get sports highlights, for example.

To do this, open the recording on either Channel 2 or 3 by selecting the clip name from the **File > Open** menu (Note that recordings must be 10 seconds long before they appear in the clip list).

Use the transport controls to select and mark the In- and Out-Points, as desired.

Without un-checking **Edit**, select **File > Save As**, enter a new clip name, and click **Enter**. A new clip is created that will play only from the In-Point to the Out Point. This clip can now be played on the third channel, or assembled into a playlist.

Now use the transport controls to locate the next desired In- and Out-Points and repeat the **Save As** command as many times as desired.

As noted above, it is usually easier to leave the edit channel in Edit mode while you plan to make multiple “Saved As” clips. If you de-select **Edit**, you will be given a choice to save or discard the edit points. Remember that you will be saving the edits to the file that is currently being recorded.

Mark In Button

Sets the current time code value into the Mark In point time display. The Mark In button can capture a time code value from the clip when it is still, or on-the-fly.

Mark In Display

Displays the time code of the Mark In point. When no Mark In point has been set manually, this displays the default SOM time code (00:00:00:00). Trim points will be automatically rounded down to the nearest GOP boundary when edits are saved.

The values in this display window may be set by three methods:

- Trim Mark In point from the keyboard: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, enter a numeric value from the keyboard.
- Trim Mark In point with up/down arrows: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, increment the up/down arrows (spin wheels) to change a numeric value.
- Whether a clip is still or playing, press the **Mark In** button to capture a time code value from the clip.

Mark Out Button

Sets the current time code value into the **Mark Out** point time display. The **Mark Out** button can capture a time code value from the clip when it is still, or on-the-fly.

Mark Out Display

Displays the Mark Out point time code. When no Mark Out point has been set manually, this displays the default EOM time code (00:00:00:00).

The values in this display window may be set by three methods:

- Trim Mark Out point from the keyboard: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, enter a numeric value from the keyboard.
- Trim Mark Out point with up/down arrows: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, increment the up/down arrows (spinwheels) to change a numeric value.
- Whether or not a clip is still or playing, press Mark Out to capture a time code value from the clip.

Duration Display

Displays the total running time (TRT) of the current clip. For example, if the first frame of the clip is 00:00:00:00 and last frame displayed at the end is 00:00:01:15, the reported duration will be 00:00:01:16. The difference between the time code of the last frame and duration is accounted for because this calculation is zero-based, and both the first and last frames play, so both are counted when calculating duration.

With NTSC drop-frame time code, the displayed duration may not be the exact numerical value of $((\text{Trim Out} - \text{Trim In}) + 1)$ due to the discontinuities in the drop-frame time line.

Review Clip Button

The Review Clip button (**|<->|**) cues the clip to the Mark In point (or SOM, if no Mark In point exists) and begins playback. Review Clip will stop at the Mark Out point. The Mark Out point will be displayed in Still mode.

The Review Clip button may be used to check the Mark In point without playing all the way through the clip. After Review Clip is pressed and play begins, all of the standard transport buttons are available for use.



Review Out Button

The Review Out button (->|) may be used to audition the Mark Out point without playing all the way through the clip. It will cue the clip to three seconds before the Mark Out point (or EOM, if no Mark Out Point exists) and then begin playback. Review Out will stop at the Mark Out Point.

After Review Out commences, all of the standard transport buttons are available for use.

Time Code Display of Edited Clips

The GUI displays absolute time when in edit mode, and elapsed time, relative to the head point, once the edit has been saved.

Embedded Audio (Option)

Introduction

The Embedded Audio option for Image Servers is available as a factory-installed option, or as an update for certain models of Image Server already in service. Embedded audio is based on SMPTE 272M-A. Key features include:

- Synchronous 20-bit audio at a 48K sample rate. Non-synchronous audio and other sampling rates are not supported.
- While up to 16 channels of audio may be present in an SDI stream (arranged in 4 groups of 4 channels), the Image Server records and plays back only Group 1 audio channels (channels 1-4).
- In E-E mode, all embedded audio will pass through the Image Server unaltered.
- The user can select audio to record from either a +4 analog, AES/EBU digital, or embedded audio source. Mix-and-match among inputs is not supported.
- Embedded audio is always included in the SDI stream on playback, and audio will simultaneously appear on the AES/EBU or analog audio outputs, as selected by the audio card option jumpers. When analog audio is selected, only channels 1 & 2 will be available at the output.
- User bits in the SDI embedded audio stream are not supported.

Setup

A software key is required to enable the Embedded Audio option. When purchased as a factory installed option, the Image Server will ship with the key already entered and the Embedded Audio option enabled. It will also include a certificate that contains the unique key code used to enable Embedded Audio. Store this document in a safe location for future use.

If you have purchased Embedded Audio as an add-on to an existing Image Server, or if you need to re-enter the key code for any reason, use the following instructions to enable Embedded Audio.

From the main Image Server GUI window, click on **Configure > Options...**



The following screen will appear:



Figure 11: Embedded Audio Configuration Window

- Type the option key number supplied by 360 Systems into the Enter New Key text box.
- Click on 'OK.'
- From the main GUI window, select **START -> SHUTDOWN -> FULL RESTART** to reset the Image Server.

Embedded Audio is now enabled.

Configuration

From the GUI window, click on **Configure > Channel 1...** . The Channel Configuration window will appear. Use this window to configure Embedded Audio.

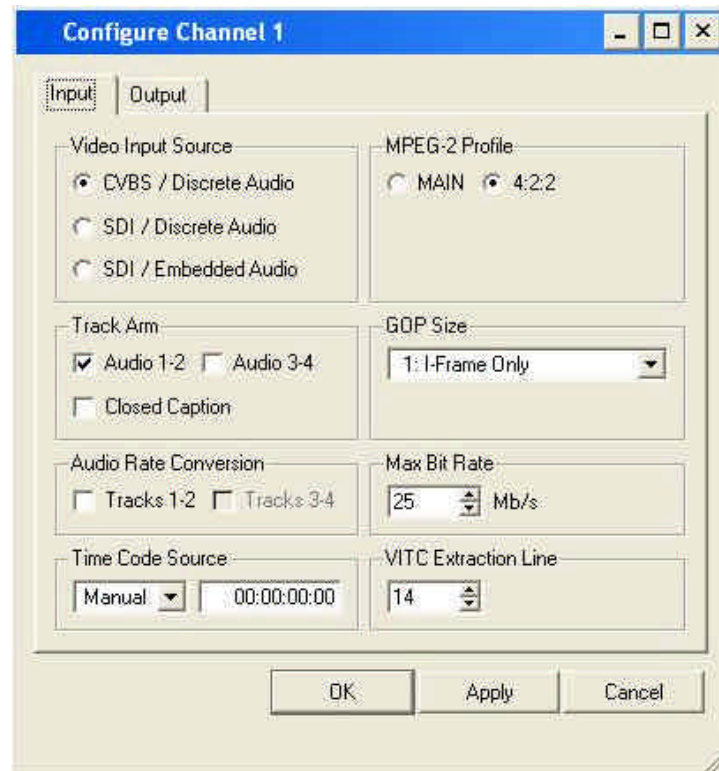


Figure 12: Channel Configuration Window

Input Source

Three buttons select the input source for video and audio. These are:

- CVBS/Discrete Audio (composite video with AES/EBU or analog audio inputs)
- SDI/Discrete Audio (serial digital video with AES/EBU or analog audio inputs)
- SDI/Embedded Audio (serial digital video with embedded audio)

The discrete audio inputs can be either: two stereo pairs (4 channels) of AES/EBU digital audio, or one stereo pair of +4dBu analog inputs, as determined by jumpers on the audio card.

Regardless of the input selected, audio will always appear in the SDI output stream as embedded audio, and at the discrete outputs as either AES/EBU (digital) or as +4 dBu balanced analog audio. The Image Server supports Group 1 embedded audio, which includes audio channels 1-4, 20-bit, 48 kHz, synchronous audio, as per SMPTE 272A.



Audio Sample Rate Conversion

Two check-boxes are provided to engage built-in sample rate converters for either (or both) of audio channels 1 & 2, and 3 & 4. When checked, the incoming AES/EBU audio tracks are converted to a 48K broadcast standard synchronized with video genlock.

Note: Audio sample rate conversion is not applicable for Embedded Audio and Audio Rate Conversion boxes will be grayed-out if the SDI/ Embedded audio check-box is selected, or if the XLR audio inputs are jumpered for analog audio.

DV Video and Graphics

DV-format video and TARGA Graphics are standard equipment on Multi-Format Image Servers. DV and Graphics is also available as an optional software accessory to extend the capabilities of the Image Server. These features supports playout of DV-25 files in native format, and TARGA graphics files including those with key and fill. DV and Graphics enables direct FTP import from Photoshop®, After Effects®, Final Cut Pro®, Xpress DV/Pro™, Liquid Edition and Vegas video.

With DV and Graphics, the Image Servers are able to function as both a graphics still-store and an animation playout server. Three simultaneous outputs give it the power to combine video, graphics and animation playback. Channels 2 and 3 can be ganged to provide key-and-fill playout, while Channel 1 plays background video. The following capabilities are included:

Importing TARGA Graphics Files

The Image Server will recognize and ingest single-frame TARGA files via FTP from most network-attached graphics workstations. TARGA files have a .tga extension, and may contain an alpha (or key) channel. During transfer, the Image Server will split the TARGA file into a Fill frame, and a Key frame if it exists. These will be converted to high-resolution MPEG-2 files, one frame in length.

For example, if an original file is named Logo.tga, the MPEG-2 files created will be named Logo.mxf (a fill file) and Logo_.mxf key (note the trailing underscore “_” added to the file name of the key.) This allows the TARGA file to be used for key and fill applications.

Once a TARGA file is ingested, it exists only as an MXF MPEG-2 file. The processed file may be transferred to-and-from network-attached storage, another Image Server, or a graphics workstation, as two separate MXF MPEG-2 files.

The resolution of a TARGA image should be 720x480 for NTSC video or 720 x 576 for PAL. If the original TARGA image is not of this resolution, the Image Server will re-scale it, possibly introducing some dimensional distortion.

Animation Import

From the Image Server’s standpoint, an “animation” is a clip with a minimum length of two seconds. A separate Alpha channel may or may not be present. Any graphics workstation capable of exporting files supported by the Image Server can make transfers to it via FTP. If an alpha channel is present, the naming conventions of the Key/Fill Mode apply. Many software programs have the ability to create content compatible with the Image Server, including Final Cut Pro® 4, Avid® DV Xpress, DV/Pro, Liquid Edition, Vegas video, and Adobe® After Effects®, Premiere® and Photoshop®.



FTP File Transfers

For standard FTP transfers, the Image Server will recognize the following file formats:

TARGA (.tga)

During transfer, the Image Server will split the TARGA file into a Fill frame and a Key (alpha) frame. These two frames will each be converted to MPEG-2 files, one frame in length. See "Importing TARGA Graphic Files" (above) and "Key/Fill Mode" (below) for additional information.

DV Stream (.dv)

These are 'elementary' DV files containing a single stream of multiplexed audio and video. The Image Server will recognize and maintain .dv extensions on DV stream files, allowing transfer of .dv files between Image Servers and graphics workstations without modification. Only audio at 48K, 16-bit is supported.

AVI Files (.avi)

An AVI file is a container that encapsulates and describes a type of interleaved audio and video. The Image Server will import Type 1 .avi files (a single stream of multiplexed audio and video) containing DV format video and 48K uncompressed audio. During ingest of .avi files, the server will convert the file into a DV stream (.dv) for storage and future transfer.

MPEG-2 (.mp2, mpg, mpeg, m2v)

The Image Server will ingest valid MPEG-2 program streams or elementary streams. The server's ingest application will recognize a program stream that encapsulates a single MPEG-2 video stream, and up to 2 stereo pairs of 16- or 24-bit, 48kHz, uncompressed audio. 16-bit audio files will be written into a 24-bit space.

MXF - Material Exchange Format (.mxf)

Transfer of MXF files between compatible products will be the preferred method of file interchange to-and-from an Image Server. 360 Systems supports ingest and playout of MPEG-2 files based on SMPTE 377M, 378M and SMPTE 381M, Operational Patterns 1a and 1b.

Key/Fill Mode

When the "Gang to Ch2" box is selected in the Channel 3 transport control window, then a pair of key and fill channels will be ganged and played together. Transport operations on Channel 2 will control both Channel 2 and Channel 3. This allows the server to play locked, frame-accurate key and fill material (either stills or clips) on Channels 2 and 3. Only a single channel of an automation controller is needed to play both the key and the fill.

Proper key and fill operation requires two clips of identical length, using the following naming convention: (the clip “myfile” is used as an example)

Fill name: myfile

Key name (Alpha): myfile_. Note the underscore at the end of the key clip.

When a clip is opened/cued on Channel 2, Image Server automatically looks for another clip with the same name, plus a trailing underscore. If the clip is found, it is loaded on Channel 3. Typically, the Channel 2 clip contains the “fill” material, while the Channel 3 clip has the “key” (or alpha) file.

An automation system, could, for example, issue a VDCP Cue command to Channel 2 for a clip called “logo”. Channel 3 would automatically be loaded with clip “logo_”. A Still or Play command sent to Channel 2 would cause both Channels 2 and 3 to display the fill and key clips, respectively.

Note that the VDCP checkbox option to “show first frame” for a Cue command is ignored for channels in ganged mode. The automation system must issue a Still command to Channel 2 to achieve this effect.

Ingesting a TARGA file via FTP automatically creates a key clip and a fill clip, each a single frame in length. For example, if file “xyz.tga” is transferred to an Image Server via FTP, then a pair of single-frame clips is created: “xyz” and “xyz_” containing the fill and key material.

Still Frames

A single-frame clip (a “still”) may be inserted into a playlist. The length of a still will appear as one frame in the clip list. When a still is encountered, the playlist will pause and hold the still image until a Play command is issued, at which point the playlist will continue to the next clip in the list. When using the GUI, the space bar (a keyboard shortcut) will also advance the playlist. Stills may be placed anywhere in a playlist. In fact, a playlist may be entirely composed of stills.

Stills are created when TARGA files are ingested. (See Page 51 for a description of TARGA file ingest.)



Advanced Playlisting

360 Systems' new Advanced Playlisting software provides an extensive set of capabilities for building, editing and playing complex sequences of program content to be played on an Image Server. Advanced Playlisting appears as on-screen windows, with a clean Graphic User Interface that makes it easy to run with no extra equipment. It's invaluable for building commercial breaks, news rundowns, still-store and clip lists. You can create and store as many playlists as needed, each with its own unique name. For many users, Advanced Playlisting may be everything you'll need to go to air.

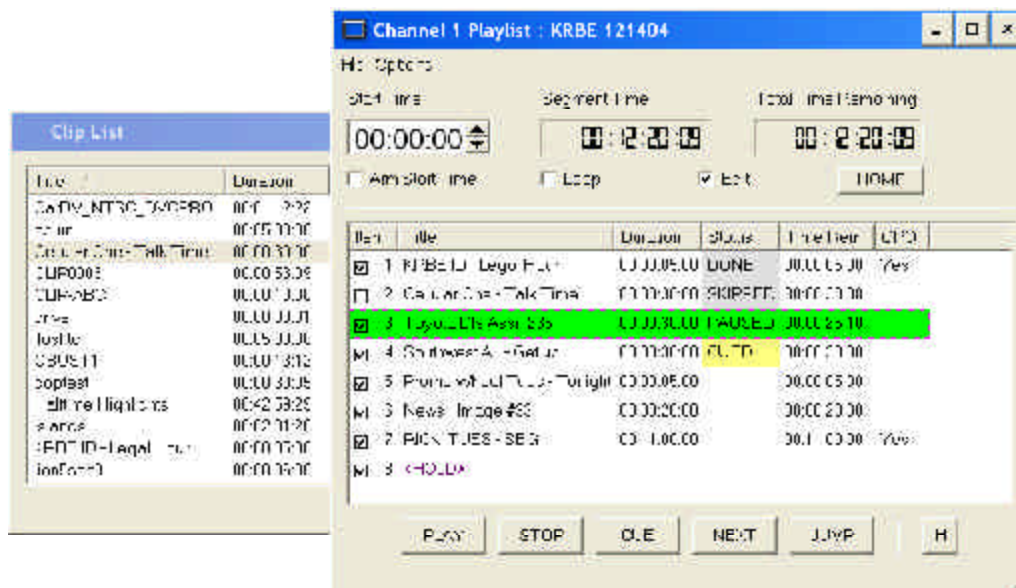


Figure 13: Play List and Clip List Windows for Advanced Playlisting

Advanced Playlist Features and Benefits

- Drag-and-drop playlist building and editing on a graphics interface
- Edit lists while they're running
- Start at any point in a list
- Displays run time for clips, plus segment length and total remaining time
- On-the-Fly commands for Pause, Skip, Hold, Next and Jump functions
- Six programmable GPI output events embedded in playlist clips
- Programmable time-of-day start for a playlist
- Generates an As-Run Log

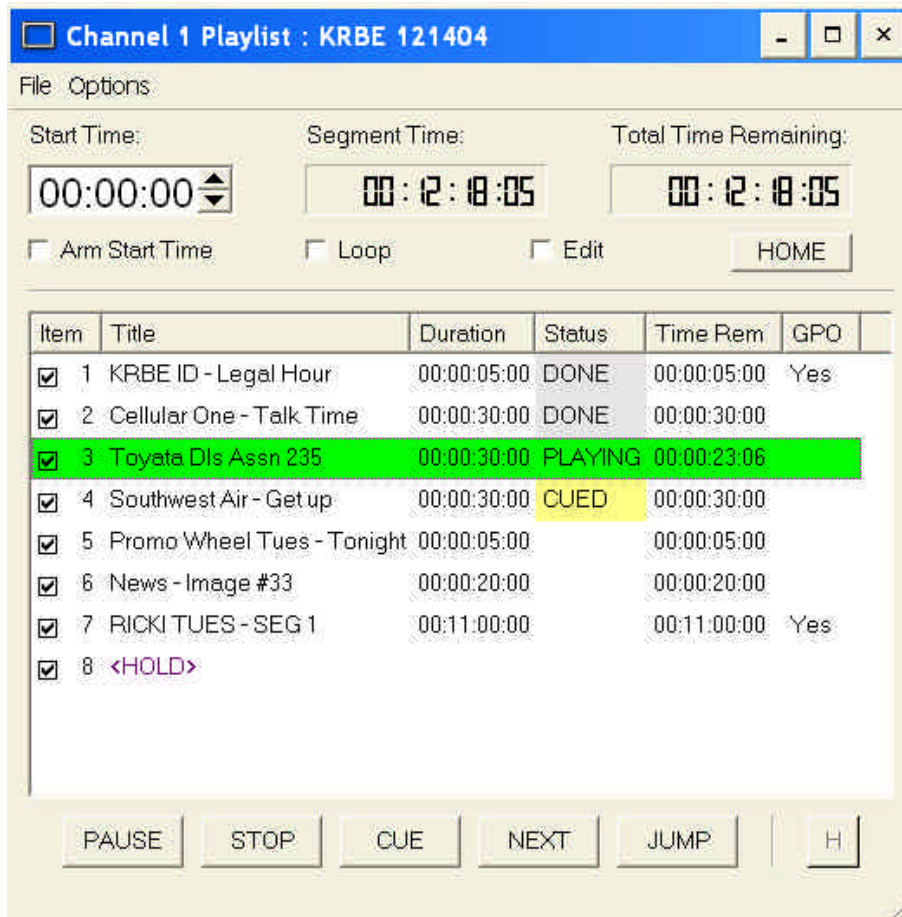


Figure 14: Screen Shot of Playlist Window

The Playlist Window

Advanced Playlisting appears as an on-screen window, accessed by clicking **Transport > Channel... > Playlist**. It presents the following information displays, time displays, control buttons and check-boxes to the user:

1. **Title Column**
The title column displays all clips contained in a playlist, with the first-to-play at the top. Clip names of up to 32 characters are supported.
2. **Duration Column**
The clip length is displayed in hours/minutes/seconds/frames.
3. **Time Remaining Column**
Time Remaining indicates when a currently playing clip will finish.
4. **Status Column**
Status refers to what has taken place, is now taking place, or will take place with regard to

each clip.

BLANK	WHITE	CLIP IS AVAILABLE TO PLAY
CUEING	PURPLE	CLIP IS TRANSITIONING TO A CUED STATUS. MAX TRANSITION TIME IS 4 SEC.
CUED	YELLOW	CLIP IS READY TO PLAY ON COMPLETION OF THE PRECEDING CLIP, OR WHEN THE PLAYLIST STARTS, IF NOT PRESENTLY RUNNING.
PLAYING	GREEN	CLIP IS ACTUALLY PLAYING.
DONE	GRAY	CLIP HAS PLAYED COMPLETELY, FROM FIRST FRAME TO LAST FRAME.
MISSING	RED	CLIP WAS NOT FOUND
CLIPPED	GRAY	CLIP BEGAN PLAYING, BUT DID NOT COMPLETE
PAUSED	GREEN	CLIP HAS BEEN PAUSED. FURTHER, WHEN PAUSE IS ASSERTED THE PLAYLIST IS NOT ADVANCING.
SKIPPED	GRAY	CLIP WAS SKIPPED, EITHER BY A NEXT OR CUE OPERATION, OR BECAUSE THE SKIP CHECKBOX WAS SELECTED.

5. Item Column

This left-most column displays sequential clip numbers within a playlist, and also a SKIP checkbox which, when un-checked, will skip over a clip, while leaving it in the playlist.

6. GPO Column

The GPO column shows whether a general-purpose control output, (number 1 through 6) is programmed to become active during playout of a clip. (An Image Server provides six GPI outputs on a rear panel connector, which may be used to control switchers, character generators or other devices.)

Time Displays, Buttons and Check-Boxes

The following buttons and check-box icons also appear in the Playlisting window:

PLAY / PAUSE (toggle)

When a Playlist is stopped, PLAY will cause the currently cued clip to play from its start. When the Playlist is in PAUSE mode, PLAY will cause the Playlist to resume playing from the current location. PAUSE stops the Playlist immediately, on the current frame of a clip.

STOP/SHOW

The Playlist will stop and video will go to black. The current clip will be re-cued from the beginning. When a clip is cued, the button legend changes to SHOW. Pressing it will display the first frame of the cued clip.

CUE

When a Playlist is running, CUE immediately prepares a selected clip for playback.

When the current clip is finished playing, the Playlist will play the Cued clip, followed by all subsequent clips. This allows the user to jump over clips. The user may also re-cue a clip that has already been played. In this case, the Playlist will restart from the selected clip, and all subsequent events will be re-played in sequence.



NEXT

While a Playlist is stopped, NEXT will prepare the next clip in the Playlist for playback. While the Playlist is running, NEXT will immediately begin playing the next clip in the Playlist. (The next clip may require several seconds to load and cue for a seamless transition.)

If the next event in the Playlist is a HOLD, the NEXT command will move to the Hold event, and video will display black.

JUMP

Cues a selected clip for immediate playback. This allows the user to jump over clips, and clips that have been already played can be re-cued. In this case, the Playlist will restart from the selected clip, and subsequent events will be re-played in sequence.

H (HOLD)

Inserts a HOLD event in a playlist immediately *before* the selected clip. The HOLD command is also available in the Playlist Item Context Menu, accessed by clicking in the playlist item window. The PLAY or JUMP command will restart a playlist after it has stopped on a HOLD line.

HOME

In the event the user has scrolled a distance up or down in the List to perform some action, and then wishes to again make the currently-playing clip visible in the List View window, HOME will do this, and will also maintain the currently-playing clip within the window, if EDIT is off. If no clip is playing, then the currently-cued clip is selected.

Segment Time Remaining Window

This window displays time remaining from present until the next HOLD command in the list.

Total Time Remaining Window

This window displays the total time of all clips that remain unplayed, including the present one.

Scheduled Start Time Window

This window can display a scheduled (time of day) start time for a playlist. When armed to start or actually running, the time in this window appears in red. Click on any of the hours, minutes, seconds or frames fields to edit it. Use the left and right arrow keys to change fields.

Play On Schedule checkbox

If a Scheduled Start Time has been entered, checking this box will arm it to begin at that time. This box will automatically un-check itself after a scheduled start has commenced.

Loop checkbox


When checked, the Image Server will loop the entire playlist after the last clip completes. Upon un-checking, the list will play to completion and then playback will stop.

Edit checkbox

Editing operations can only be performed when the Edit box has been checked. This box protects the playlist content from accidental modification. When EDIT is on, the playlist window does not automatically track the currently playing clip.

The Clip List Window

The Clip List window displays all clips that are available on the Image Server, including title, duration, and video format. The Clip List Window is the source for all clips used to build a playlist in the adjoining Playlist window.



Title	Duration	Profile
Bank of America - Gold Years	00:00:30:00	4:2:2
Burger Stop -2 for 1	00:00:30:00	4:2:2
Cellular One - Talk Time	00:00:30:00	4:2:2
Hot Spot Cell - Talk	00:00:30:00	4:2:2
KRBE ID - Legal hour	00:00:05:00	MAIN
Lettuce Growers Assn - Green	00:01:00:00	4:2:2
News - Image #33	00:00:30:00	4:2:2
Promo - Friends - Today	00:00:15:00	4:2:2
RICKI TUES - SEG 1	00:07:18:05	4:2:2
RICKI TUES - SEG 2	00:10:00:00	4:2:2
RICKI TUES - SEG 3	00:00:17:01	4:2:2
RICKI TUES - SEG 4	00:24:21:04	4:2:2
Southwest Air - Get up	00:00:30:00	4:2:2

Figure 15: Clip List Window

Clip List Window

To open the Clip List window, click **Window > Clip List** on the Main Menu Bar. A clip may be dragged from the Clip List window to a position on the playlist. The following rules will be helpful when using drag-and-drop:

- Drag-and-drop only works when a Playlist is in the edit mode (EDIT checkbox is checked).
- When a clip is dropped, it will be inserted in the Playlist ABOVE the clip it was dropped over, and will occupy the event number of that clip.
- Clips can be rearranged within a Playlist using drag-and-drop.
- Clips can also be dragged from other Playlist windows. To do this, the target Playlist must be enabled for editing.
- Clips cannot be inserted before a clip that is scheduled to begin playing within the next four seconds (approx).
- Drag-and-drop also works while a Playlist is running.
- To copy a clip within a Playlist, hold the **Ctrl** key while selecting and dragging the clip.
- Multiple non-consecutive clips can be selected by holding the **Ctrl** key as you click. They will insert into the list in alphabetical order.

- An entire range of clips can be selected by holding the Shift key and clicking two clips.

The following suggestions for advanced users apply to working in the Clip Window *when only one Playlist is enabled* for editing:

- Double-clicking a clip will append it to the end of a Playlist, if the Playlist's Edit Box is checked.
- The Enter key will append a selected clip to the end of a Playlist if its Edit Box is checked.

Programming GPI Outputs

The Image Server has six General Purpose Interface outputs, referred to as GPO 1 through GPO 6. Any of these can be programmed to go active at a predetermined time, or *Offset*, after the beginning of a Playlist clip. An active *Duration* can also be set, after which the output again goes inactive. In all cases, every output will go inactive when a clip ends. By default, a new clip contains no programmed GPI output commands.

Information on interfacing to GPI outputs will be found in Appendix A of the Image Server Operations Manual.

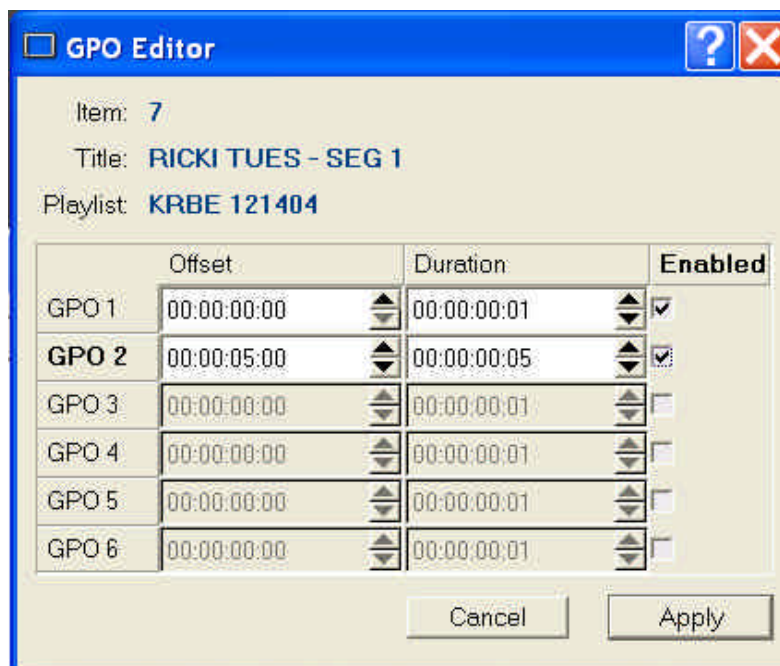


Figure 16: GPI Output Editor Window

To configure GPI output events for a Playlist clip:

- Open the Playlist for editing: Click the **Edit** check-box.
- Right click on the clip to which you wish to assign GPI output events. Select the **Edit GPO...** command from the Playlist Item Context Menu. The GPO Editor window will appear. Note that you cannot otherwise edit a Playlist while the GPO Editor window is open.

- Enable one or more desired GPI outputs, numbers 1 to 6, by checking its checkbox.
- Select the GPO Offset with the mouse or by using the arrow keys on the keyboard (see GPIO Editor Keyboard Shortcuts below). The Offset is a positive time value that determines how long after the beginning of a clip its GPI output will become active.
- Select the GPO Duration by using the mouse or the arrow keys.
- Repeat the steps above for every output to be configured. Click the **Apply** button to make the changes active and close the window.

GPI Output Editor Keyboard Shortcuts

Tab	Cycles the keyboard focus through all buttons and numeric windows. On the GUI each button, or other item that can be controlled by a keyboard command, will appear surrounded by a dotted line.
Right Arrow	Same as Tab, except it will also advance through individual timecode fields.
Left Arrow	Same as Right Arrow, except it cycles in the opposite direction.
Up Arrow	Increments the hours, minutes, seconds or frames field of a timecode window when it has the keyboard focus.
Down Arrow	Decrements the hours, minutes, seconds or frames field of a timecode window when it has the keyboard focus.
Enter	Toggles the enabled/disabled state of a GPI output. This is the equivalent of checking or un-checking the Enabled checkbox.

Programming GPI Inputs

The Image Server also provides six programmable GPI inputs, which can be used to initiate playback of playlists, individual clips, and multiple groups of clips. Collectively, the server's GPI inputs and outputs present a powerful and universal interface to switchers, character generators and other equipment.

Instructions for programming GPI inputs will be found in the System Configuration chapter.

Playlist Window Keyboard Shortcuts

Tab	Cycles the keyboard focus through all buttons and numeric fields.
C	CUE
E	Toggle Edit checkbox
H	HOLD
J	JUMP
L	LOOP
N	NEXT
P / Space	PLAY
S	STOP



- T Toggle Arm Start Time checkbox
- HOME HOME
- ENTER / RETURN Invoke the Playlist Item Context Menu
- OPEN PLAYLIST WINDOW ALT 1, ALT 2 or ALT 3

The As-Run Log

The Image Server's Advanced Playlisting software is able to generate a log of all files played during the execution of a playlist, within a 24-hour day. This data can be exported via Ethernet to an external computer. As-Run logs are used in management and billing to document that commercials or programs were actually played.

Enabling As-Run Logs

To turn on As-Run logs, open a Playlist window, select Options, then click on As-Run Logs. When turned on, a check mark will appear next to the As-Run log label. Once enabled, any files played by a playlist will be written to an As-Run log.

As-Run logs are available only through FTP downloads. After logging into an Image Server, select the ASRUN folder. All logs are stored in this location, and have the extension ".arl".

Sample As-Run Log

```
IS-76152 as-run (Ch2:KQRS) Engr Wed Feb 02, 2005 [Wednesday PM]      Pg 1
 1 10:54:40 00:00:05:00 KRBE ID - Legal                          PLAYED OK
 2 10:54:45 00:00:30:00 Cellular One – Talk Time                    PLAYED OK
 3 10:55:15 00:00:30:00 Burger Stop – 2 for 1                      PLAYED OK
 4 10:55:45 00:00:15:00 Promo – Friends - Today                PLAYED OK
 5 10:56:00 00:00:30:00 Bank of America – Gold Years          PLAYED OK
 6 10:56:30 00:07:18:05 RICKI WEDNESDAY – SEG 1                PLAYED OK
```

As-Run Log Page Header

This section describes the format of the first line (page header):

```
IS-76152 as-run (Ch2:KQRS) Engr Wed Feb 02, 2005 [Wednesday PM]      Pg 1
```

IS-76152: IS-XXXXX, where XXXXX is the unique machine ID. This is the same ID that is used to create keys for optional software.

As-run (Ch2:KQRS): ChX is the channel number and KQRS is the name of the specific channel, as defined in the Configuration System window.

Engr: The name of the Image Server, as defined in the Configuration System window.

Wed Mar 30, 2005: The base date to which clip times are referenced.

[Wednesday PM]: The name of the playlist

Pg 1: The page number of the printout.

As-Run Log Body

This section describes the format of the body of an As-Run log:

2 10:54:45 00:00:30:00 Cellular One – Talk Time PLAYED OK

2: The line number (order) of the clip as it appears in the playlist. The same clip could have multiple numbers as files are added or deleted.

10:54:45 The time at which the clip was played in HH:MM:SS, on a 24-hour clock.

00:00:30:00 The length of the clip in HH:MM:SS.FF, on a 24-hour clock.

Cellular One – Talk Time: The name of the clip.

PLAYED OK: The status of the played clip. Other possible status conditions are CLIPPED (meaning less than its full length played); SKIPPED (meaning it was skipped over); and STOPPED (meaning it was stopped during payout).

Configure System - Names

The name for a particular Image Server, and its three video channels, can be set using the **Configure>System>Names** tabs of the main menu bar. Select **OK** or **Apply** after entry. These names will appear on all subsequently generated As-Run logs.

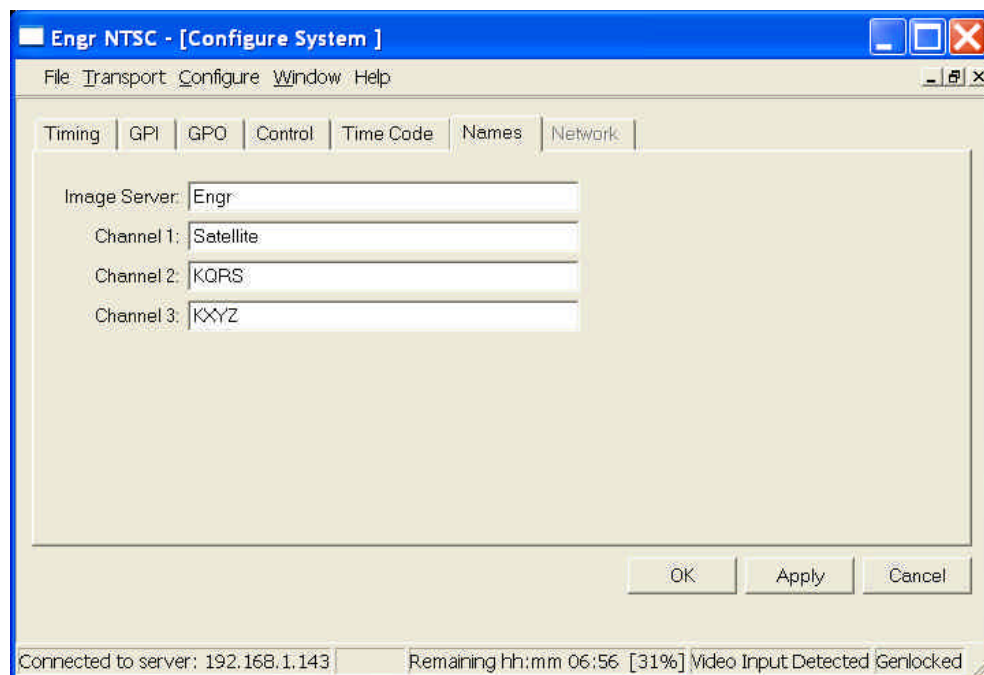


Figure 17: Screen Shot of Name Configuration for Image Server

FTP Transfer of As-Run Log

The As-Run logging function within Advanced Playlisting can be turned on or off. In the Playlist window, select **Options > As Run**. When the playlist is run, all clips played, clipped or skipped are logged to a text file.

The file is accessed by logging on to the Image Server's FTP service and opening the folder AsRun. The As-Run log contained in it can be transferred from an Image Server to another computer using standard FTP transfer tools. The FTP window can be treated like any other Windows Explorer window.

Using Microsoft Internet Explorer, FTP into the Image Server. A folder named "asrun" will be listed in the Directory Contents. To copy the As-Run log to you computer, double click on the 'asrun' folder.

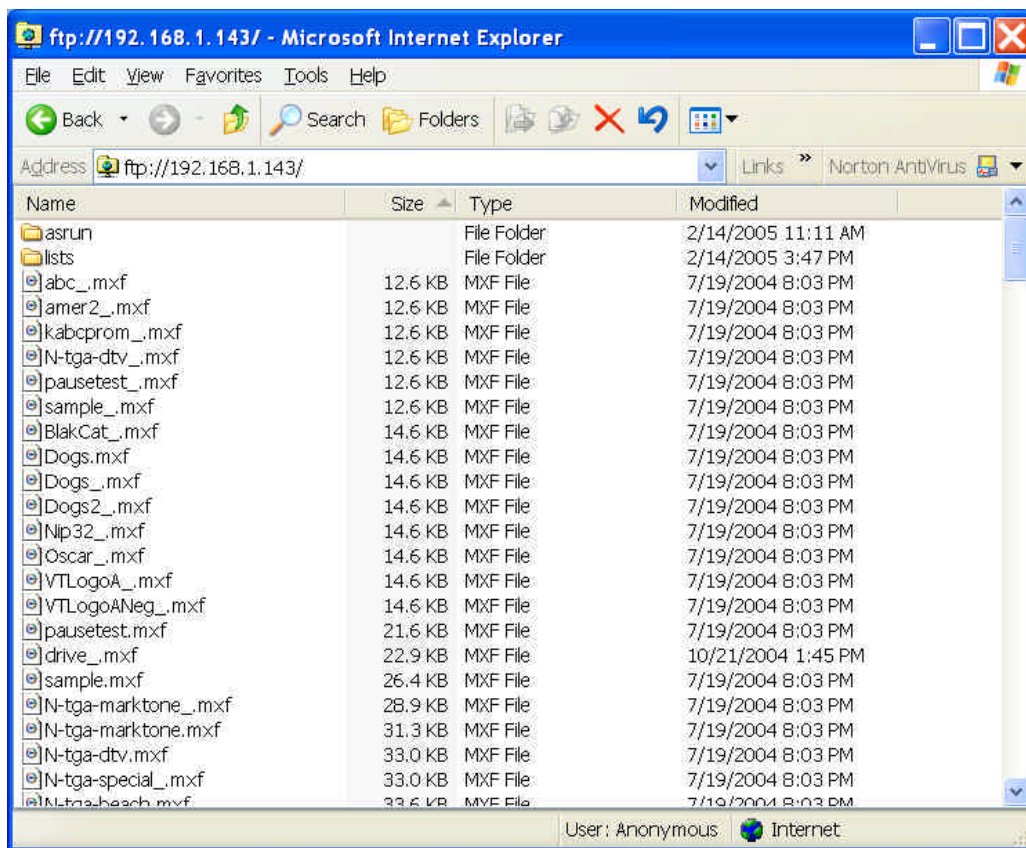


Figure 18: Screen Shot of As-Run Folder in Image Server Directory

As-Run logs are located in this folder, as shown below. Right-click the file to be transferred, and choose either “Copy to Folder...” or “Copy” from the drop-down menu. Windows will then prompt you to select a file folder in which to store the log. Alternative FTP programs will provide similar transfer means.

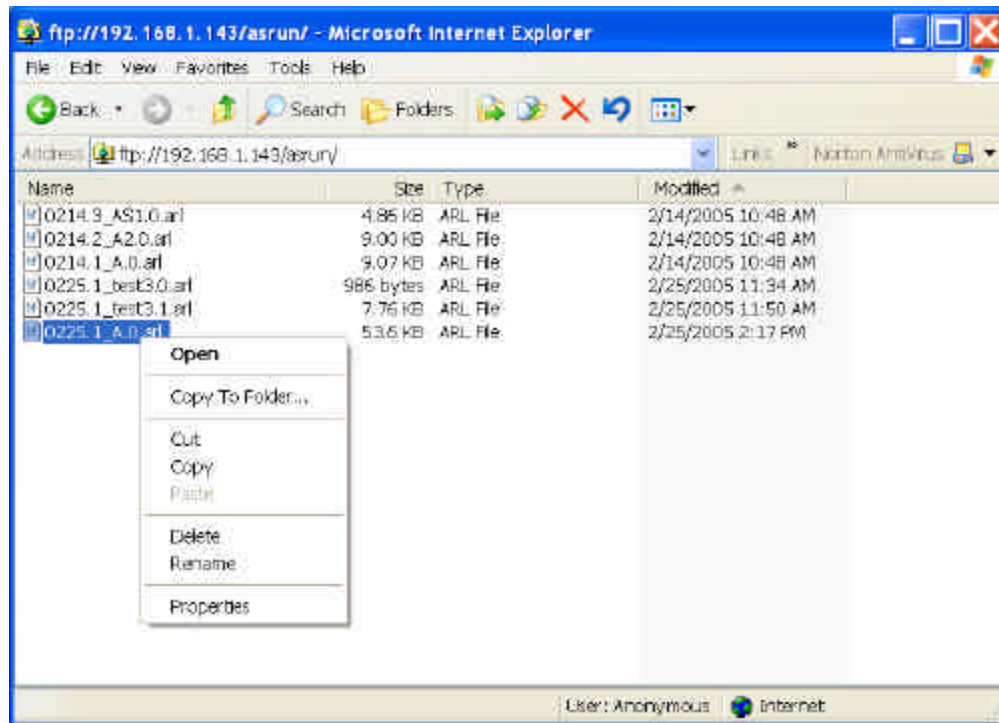


Figure 19: Screen Shot of As-Run .arl Files

As-Run Log Naming Convention

Using the file “0225.1_test3.1.arl” as an example, the As-Run naming convention is as follows:

0225: The month and day (Feb 25) on which the playlist was opened for playout.

1: The Image Server channel on which the playlist was played.

test3: The name of the playlist.

1: The instance of the playlist. Each time you open a single playlist more than one time in a single day, this number will automatically increment to maintain unique filenames.

arl: The file extension designating a 360 Systems Image Server As-Run log file.

Note: “.” and “_” are used as delimiters within the As-Run log file names.



Editing a Clip

Although not a part of Advanced Playlisting, the Image Server provides accurate tools for trimming the head and tail of a clip. Trimming and playlisting together allow the Image Server to create accurate and complex rundowns. Trims *do* need to be performed *before* inserting a clip into the playlist.

The edit controls are activated with the **Edit** check box on each channel's GUI window. This region contains a number of buttons that define the beginning and end of a selected region, plus their associated time code displays.

Non-destructive Mark In and Mark Out trim points can be set to define a portion of the clip to be played. These "pointers" do not create a new clip from the original material; they act like virtual trims, and material outside of the trim points is excluded, but can be retrieved by resetting the Mark points. After setting the Mark In and Mark Out points, clips will play between these points. These values are saved with the clip.

Edits may be saved to the current clip by de-selecting the **Edit** check box, or choosing **Save** from the clip window **File** menu. **Save As** works to save the edit points to a new clip name, even if the edits have not been saved in the current clip. This is a great help while conducting an Edit-while-Recording.

Mark In Button

Sets the current time code value into the Mark In point time display. The Mark In button can capture a time code value from the clip when it is still, or on-the-fly.

Mark In Display

Displays the time code of the Mark In point. When no Mark In point has been set manually, this displays the default SOM time code (00:00:00:00). Trim points will be automatically rounded down to the nearest GOP boundary when edits are saved.

The values in this display window may be set by three methods:

- Trim Mark In point from the keyboard: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, enter a numeric value from the keyboard.
- Trim Mark In point with up/down arrows: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, increment the up/down arrows (spin wheels) to change a numeric value.
- Whether a clip is still or playing, press Mark In to capture a time code value from the clip.

Mark Out Button

Sets the current time code value into the Mark Out point time display. The Mark Out button can capture a time code value from the clip when it is still, or on-the-fly.

Mark Out Display

Displays the Mark Out point time code. When no Mark Out point has been set manually, this displays the default EOM time code (00:00:00:00).

The values in this display window may be set by three methods:


- Trim Mark Out point from the keyboard: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, enter a numeric value from the keyboard.
- Trim Mark Out point with up/down arrows: Use the mouse or keyboard arrows to move between fields. When a field is highlighted, increment the up/down arrows (spinwheels) to change a numeric value.
- Whether or not a clip is still or playing, press Mark Out to capture a time code value from the clip.

Duration Display

Displays the total running time (TRT) of the current clip. For example, if the first frame of the clip is 00:00:00:00 and last frame displayed at the end is 00:00:01:15, the reported duration will be 00:00:01:16. The difference between the time code of the last frame and duration is accounted for because this calculation is zero-based, and both the first and last frames play, so both are counted when calculating duration.


With NTSC drop-frame time code, the displayed duration may not be the exact numerical value of $((\text{Trim Out} - \text{Trim In}) + 1)$ due to the discontinuities in the drop-frame time line.

Review Clip Button

The Review Clip button () cues the clip to the Mark In point (or SOM, if no Mark In point exists) and begins playback. Review Clip will stop at the Mark Out point. The Mark Out point will be displayed in Still mode.

The Review Clip button may be used to check the Mark In point without playing all the way through the clip. After Review Clip is pressed and play begins, all of the standard transport buttons are available for use.

Review Out Button

The Review Out button () may be used to audition the Mark Out point without playing all the way through the clip. It will cue the clip to three seconds before the Mark Out point (or EOM, if no Mark Out Point exists) and then begin playback. Review Out will stop at the Mark Out Point.

After Review Out commences, all of the standard transport buttons are available for use.

Time Code Display of Edited Clips

The On-Screen interface displays absolute time when in edit mode, and elapsed time, relative to the head point, once the edit has been saved.



Automation Control

Image Servers can be controlled by leading broadcast automation systems, instant replay panels, video switchers, and many remote control devices. The Image Server accepts VDCP, P2, and Odetics commands generated by most automation systems, on three 9-pin connectors. To provide compatibility with simple controllers and push buttons, the server also provides GPI (contact closure) inputs, and programmable command outputs.

Remote Serial Control

The Image Server's three 9-pin serial control ports allows independent control of its video channels. Each port can respond to channel ID numbers that are equal to, or multiples of, its base number. For example, channel 1 will also respond to 4, 7, 10, etc. This can be helpful when automation system needs to control many Image Servers at once.

Only *one* serial controller can control a video channel at a time. For example, the Image Server's multiple serial ports allow simultaneous connection of an automation controller and a desktop editing controller. In this way, one could configure an edit controller on Channel 1 for record, playout, and editing, while an automation controller on Channel 2 manages play-to-air operations. Alternatively, a single controller could control the operation of all Image Server channels.

Controller Priority

When the **Serial Control** box is checked, the first controller to gain control of a video channel will have exclusive command. This prevents conflicting instructions from causing unexpected behavior. However, a local user may take control of a channel by de-selecting the **Serial Control** check box in that channel's dialog window. A GUI window will pop up, indicating that the user is about to take control from the Serial Port. Select **YES** to take control. The user may also take control of the channel by selecting **Control > Take Control** from the Transport menu.

Many remote control protocols do not provide a method to send a "disconnect" message to the Image Server, or communication might be lost before a disconnect command is received. This may make it difficult for more than one controller to share a video channel. If a channel becomes locked to a controller, you may use the GUI channel control window to break the lock by deselecting **Serial Control** mode. Another controller may be connected to the channel by selecting **Serial Control** and sending the new connect commands from the remote controller.

Communication Protocol Setup

Image Servers support VDCP, P2 and Odetics command protocols. Set the desired protocol for each server serial port with the Serial Ports dialog box of the GUI, as shown in the following illustration. From the main menu, select **Configure**, then **System**, then the **Control** tab.

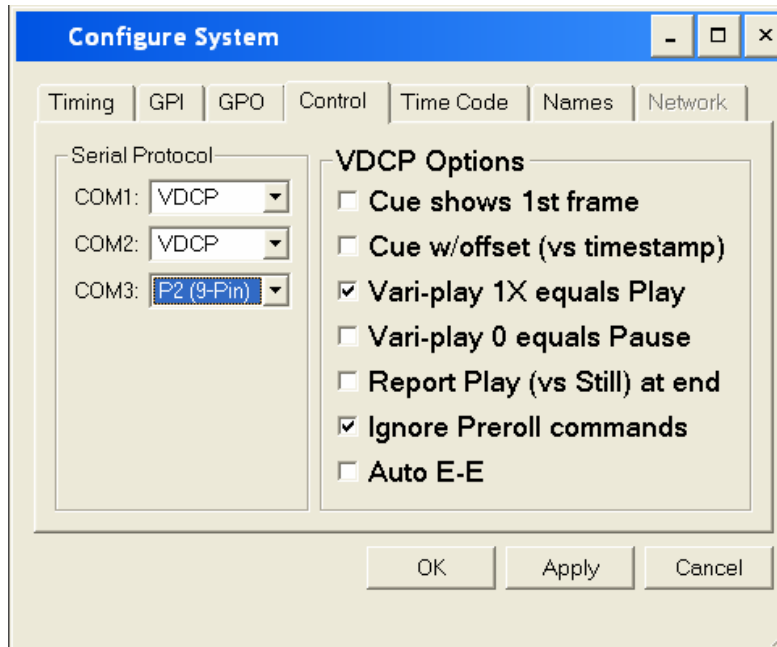


Figure 20: Control Protocol Setup Window

VDCP Options

As illustrated in Figure 13, a number of check boxes are provided that control how the Image Server will respond to certain VDCP commands. Once set, these options remain selected when the server is turned off, and until changed by the user.

Cue Shows 1st Frame

Upon receiving a Cue With Data or a Play Cue command, the server will cue the clip then jog to and display the first frame of video.

Cue with Offset (vs. Timestamp)

When checked, the time code for the clip becomes “zero-based” with reference to the head point. To move to the head point of the clip, the automation controller would send a time code value of 00:00:00:00, regardless of the clip’s original time stamp. When unchecked, the Image Server will calculate time code position based upon the time stamp from the first frame of the original, unedited clip.

Vari-Play 1X Equals Play

Image Server will interpret a Vari-play 1x command as a Play command.

Vari-Play 0 Equals Pause

Image Server will interpret a Vari-play 0x command as a Pause command.

Report Play (vs Still) At End

When the end of the clip is reached, Image Server will report Play to the automation controller, instead of Still.

Ignore Preroll Commands

The default value for Image Server's Preroll time is 10 frames. Automation controllers generally have the ability to set this value in their own configuration menus, negating a need to adjust this value dynamically. This box should typically be checked.

Auto E-E

Toggles Auto E-E mode.

Communication Port Parameters

The serial data transfer parameters for the Image Server are fixed, and cannot be changed. These characteristics are common to all automation controllers:

Baud Rate	38.4 K Baud
Start Bits	1
Data Bits	8
Parity	Odd
Stop Bits	1

Tested Automation Controllers

The Image Server has been tested by 360 Systems and manufacturers of equipment listed below, and found to operate correctly. This list is not comprehensive, and the inclusion or absence of a product does not indicate a preference for any make or model. Operational variations do exist between makes and models.

Manufacturer	Controller	Protocol	Notes
HARRIS AUTOMATION	ADC-100	VDCP	ALL HARRIS CONTROLLERS SAME
SUNDANCE DIGITAL	FAST BREAK	VDCP	
NVERZION	EMC-NT	VDCP	
CRISPIN CORP.	SYSTEM 2000	VDCP	
FLORICAL	AIR BOSS	VDCP	
DTG	AIRO	VDCP	
LEIGHTRONIX	TDC/IP	VDCP	
TIGHTROPE MEDIA	CABLECAST	P2	
HARDATA	HDX VIDEO	ODETICS	ARGENTINA / SOUTH AMERICA
THOMSON-PARKERVISION	PVTV-PLUS NEWS	VDCP	ALL CR SERIES



Tested Remote Control Panels and Switchers

The Image Server has been tested by 360 Systems and manufacturers of the remote control devices and video switchers listed below, and found to operate correctly.

Manufacturer	Controller	Protocol	Notes
ROSS VIDEO	SYNERGY® SWITCHERS	VDCP	
DNF CONTROLS	4000-CL	VDCP	ALSO USED WITH DNF SHOT BOX
DNF CONTROLS	300-SSM	P2	BVW-75, ALSO ODETICS PROTOCOL
ASH VALE	SM-2	P2	SLOW MOTION CONTROLLER
BUF	VTC-4000	P2	BVW-75, ALSO ODETICS PROTOCOL
BUF	SPOT	VDCP	ALSO ODETICS PROTOCOL
LANCE DESIGNS	TDC-100	ODETICS	
HI-TECH SYSTEMS	ACTIV CART BOX	VDCP	ALL VDCP PRODUCTS SAME

The Image Server can play video with seamless transitions from all three outputs. (Earlier software versions had 2-channel modes and 3-channel modes; software upgrades now produce gap-free playback under all conditions.) A 10-frame pre-roll is required to allow the server time to access video data for playback.

Uses for Extra Server Ports

If a video port on the server is not designated for a purpose, there are several good uses it may be put to that take only a small amount of extra work and resources, and enhance overall system capability:

- A fully functional, wired, and running backup channel in the event of a problem on a video output.
- A preview channel for independent browsing/viewing of a clip.

Concurrent Playback

All clips on an Image Server can be accessed concurrently by multiple applications. This means for example, that a clip can be played on multiple channels; may be played while recording; or may be transferred to another machine while playing. This can also be done on multiple channels, allowing a single clip to play concurrently with several different offset times.

System Configuration

There are many configuration settings available in the Image Server 2000 and the Multi-format Image Server. The location of each group of settings is associated with its usage. Generally, there are two types: System and Channel. The Date/Time setting applies to the entire system, but is accessed directly from the Configure menu. Channel configuration settings are separated into Input and Output groups.

Setup configuration menus can be accessed from the **Main Menu > Configure** choice.

System

Open this dialog window to configure general control and sync parameters, such as GPI, sync, time code, and video standards. See *System Configuration Options* below for more information.

Options

Optional features purchased along with Image Servers include a certificate with a unique 16-digit Key code. Keep this certificate in a safe location. While optional features are generally installed and activated at the factory, the Key code will be required should you ever need to perform a fresh software install on your Image Server. If you purchased an optional feature (such as Embedded Audio or DV and Graphics), separately from your Image Server, a certificate will be included with your updated software. To enable purchased options, select **Configure > Options...** and enter the Key value found on the included certificate.

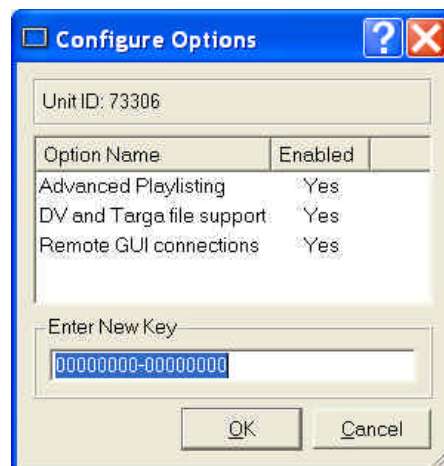


Figure 21: Configure Options Window

Date/Time

Open this dialog window to set the Image Server internal system date and time. This information will be used to time stamp the data files of new recordings. All channels must be idle to change the Date/Time setting.

Channels

Select a video channel from this dropdown menu to configure channel-specific audio, video, and time code parameters. For more information about changing channel setups, see *Channel Configuration* on page 82.

Many options are presented on a single screen. Some choices logically exclude others. When making certain selections, other selections may become available, unavailable, or have different range limits. Options that become unavailable will be grayed out.

To accept changes made to the configuration dialog box, click **Apply**. Click **OK** to accept changes and close the configuration dialog window. Click **Cancel** to close the window and discard any changes. Changes will become effective when the channel starts the next (new) recording.

System Config Options

The Configure System dialog box contains several tabs that organize general machine settings:

Timing Tab

Select the Timing tab to configure the following parameters:

System Parameter	Value
Video Sync	Genlock, Internal
Genlock Timing	Lines: -4 to +12 Pels: -200 to +200
Output Mode	2- or 3-Channel

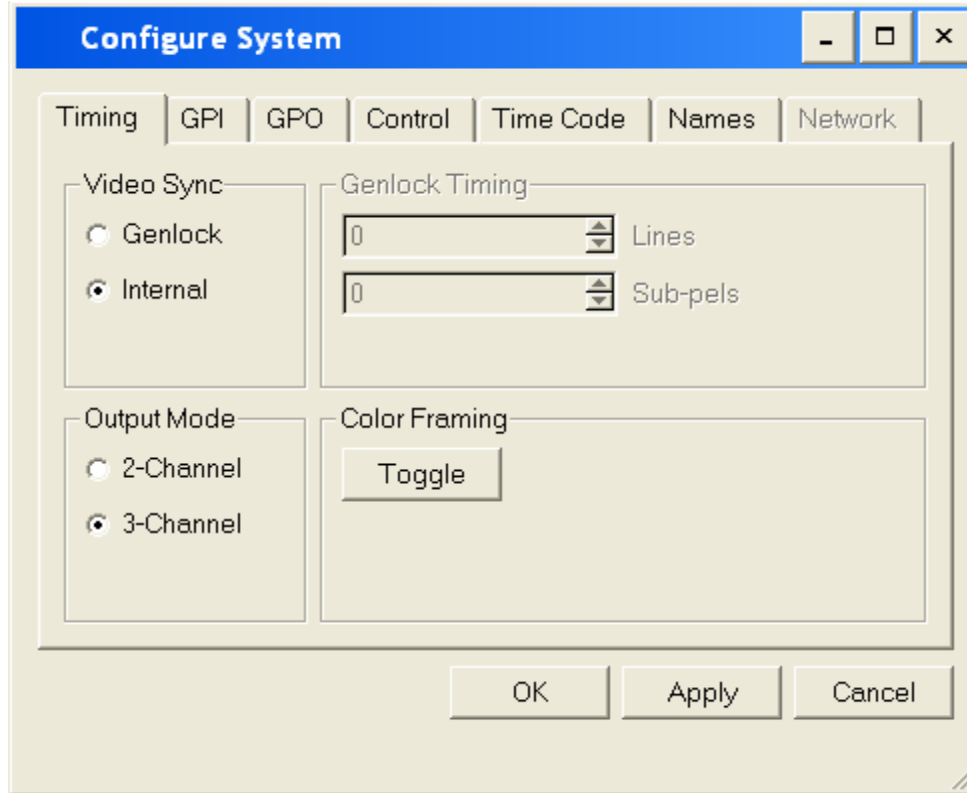


Figure 22: System Timing Configuration Window

Video Sync

During normal operation, the Image Server must be referenced to an external genlock reference in the form of CVBS Black. A BNC connector is provided for this purpose on the rear panel. An internal crystal reference is also provided when Image Server is used as a stand-alone player, or for convenience in performing tests in the laboratory.

The front-panel Genlock indicator provides the following information:

If the external sync reference is good, the **Genlock** indicator will light.

If the external sync reference is bad, the **Genlock** indicator will blink.

If the internal reference is selected, the **Genlock** indicator will not light.

Recording is not possible without an external Genlock reference.

Video Format

The Image Server is delivered in different models for NTSC or PAL. Files can only be played by the machine model for which they were recorded.

Genlock Timing

Upon selecting the external sync reference, the video timing may be adjusted in terms of lines (H sync) and pels (pixels) with reference to the external sync.

Color Framing

The Color Framing toggle setting allows all channels to achieve the correct color frame sequence. Image Server's video channels are always correctly aligned with respect to each other; however, after cycling power, color framing could be out of phase with reference to the external genlock input. Color framing errors may appear as brief horizontal image shift when switching between separate video sources.

NTSC Models: The Color Framing toggle button advances the phase of all channels by 180 degrees with respect to the external genlock signal.

PAL Models: The Color Framing toggle button advances the phase of all channels in 90 degree increments, with respect to the external genlock signal.

The Color Framing toggle setting is retained during a warm reset (i.e. by selecting "Reboot Image Server" from the GUI Start menu), but is not restored after a cold shutdown (by either selecting "Halt Image Server" from the GUI Start menu, or powering down the Image Server by pressing the front panel power switch). In the case of a cold shutdown, Color Framing may need to be toggled to properly align with the external genlock input.

The Color Framing toggle setting will have no visible effect when Video Sync is set to Internal.

GPI Inputs, Programming

Six GPI inputs are available for remote control of Image Server functions. Each is internally pulled high to +5 volts, and is active when pulled to ground through a contact closure.

Two drop down menus provide independent selection of control functions and channel assignments for each GPI input. Assignable functions include Play, Stop, Re-cue, Record, and Pause. Each may be mapped to Channel 1, Channel 2, Channel 3, Channels 1 + 2, Channels 2 + 3, or Channels 1 + 2 + 3.

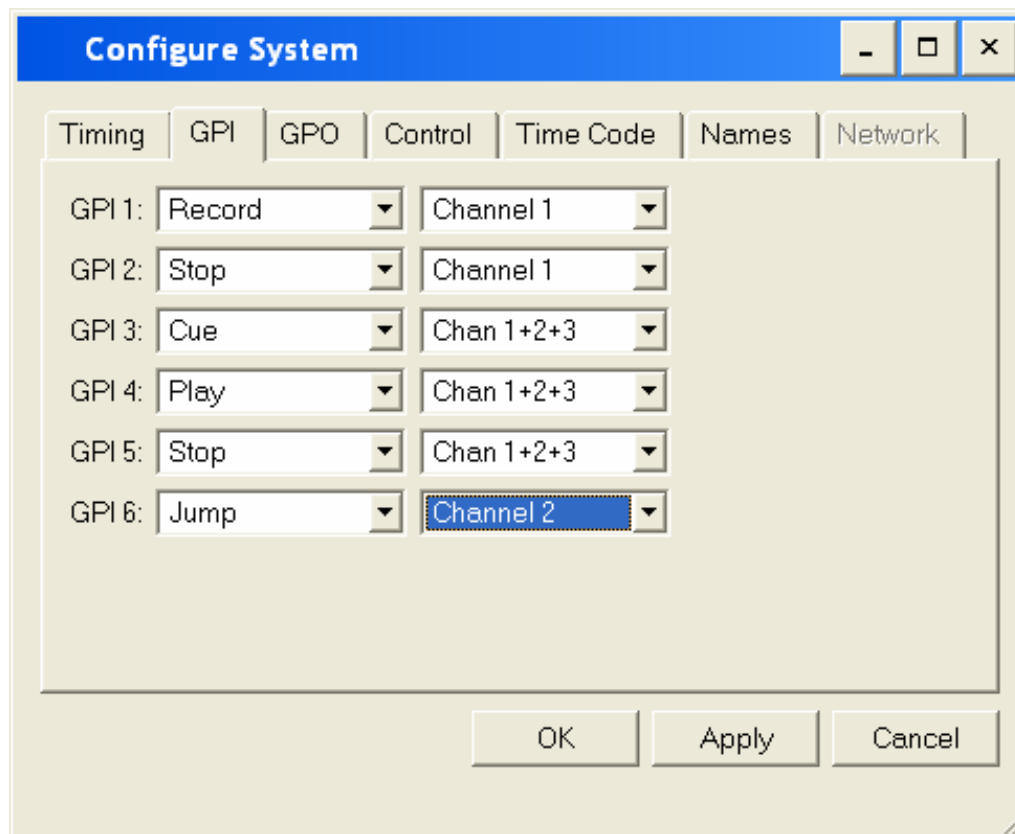


Figure 23: GPI Input Configuration Window

GPI Outputs, Programming

Six GPI outputs are available for use as tally or status indicators, driving an LED or logic input. Outputs are open collector, active low.

Two drop down menus provide independent monitoring for each output. Available status parameters include Idle, Playing, and Recording. Each of these states may be monitored for Channel 1, Channel 2, Channel 3, Channels 1 + 2, Channels 2 + 3, or Channels 1 + 2 + 3.

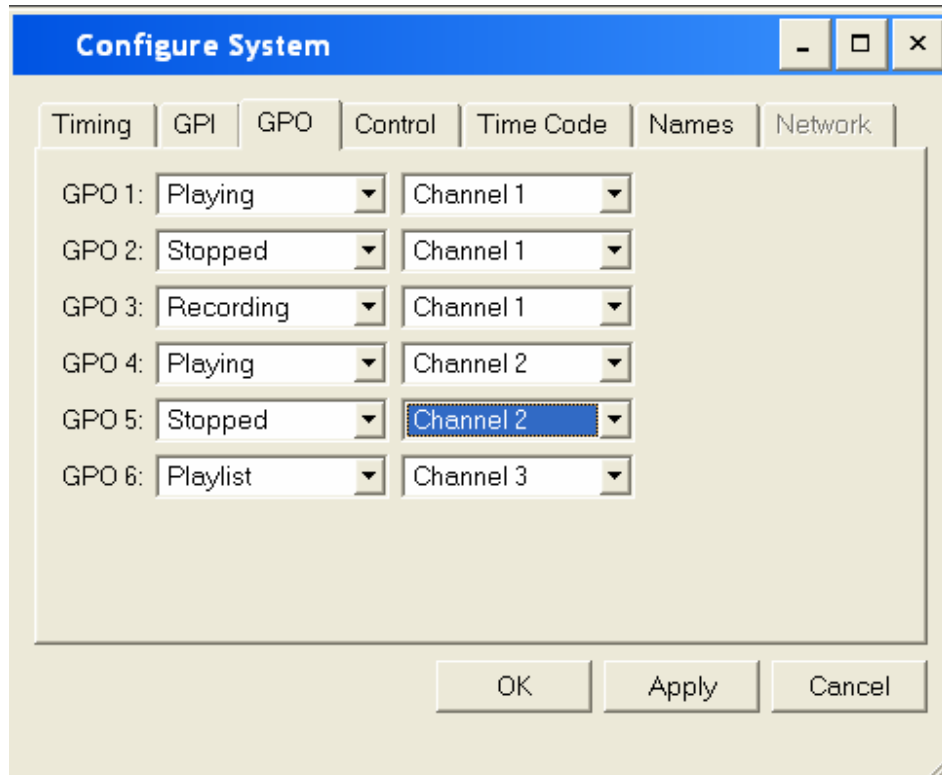


Figure 24: Output Configuration Window

The GPI connector pinout will be found in Appendix A.

Control

Descriptions of Control features may be found in the Automation Control section starting on page 69.

Time Code

The Image Server supports only drop frame time code for NTSC operations.

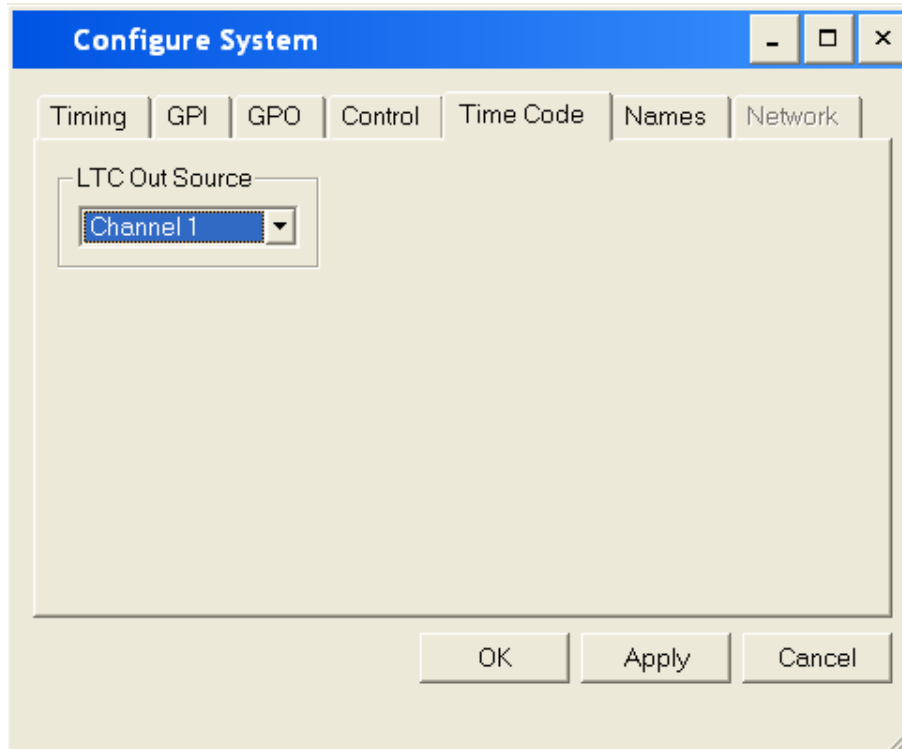


Figure 25: System Time Code Configuration Window

Names

The Main Image Server GUI window and each of the individual Channel windows may be assigned unique names. This is especially useful when using either the Remote GUI or operating multiple Image Servers from a single computer monitor (using a KVM switch).

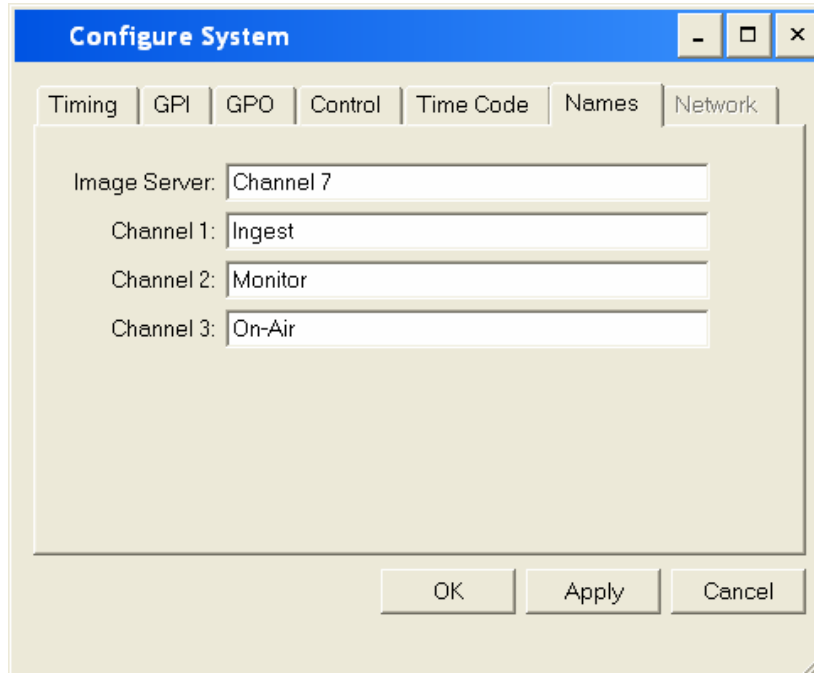


Figure 26: Configure System **Names** Window

Network

A complete description of the Network window may be found in the Configuring Network Settings section beginning on page 99.



Channel Configuration

Input channel configuration pertains to recording processes, which take place on Channel 1. Output configuration pertains to playback variables, and can be set individually for each of the three server channels.

Changes made to recording parameters are recognized by the server *the next time a clip is created* (from the GUI, when FILE>NEW>CREATE is invoked). If the bit rate is changed, for example, *after* creating the clip name, but *before* recording, the change will *not* be applied to this recording. Do not make changes to a recording's characteristics after you have initiated it.

Input Configuration

The factory default settings for Input Channel Configuration are presented for reference. Most of these video encoding options will be suitable for general broadcast operations, but may not be optimum for contribution content or low bit rate use.

INPUT SOURCE	CVBS	MPEG-2 PROFILE	4:2:2
TRACK ARM		GOP STRUCTURE	I-FRAME
Video	ON		
Audio 1-2	ON	BIT RATE	25
Audio 3-4	OFF		
CC	OFF		
AUDIO Sample Rate Conversion			
Tracks 1-2	OFF		
Tracks 3-4	OFF		
TIMECODE SOURCE	MANUAL		
Start:	00:00:00:00		

Table 1: Channel 1 Factory Default Settings

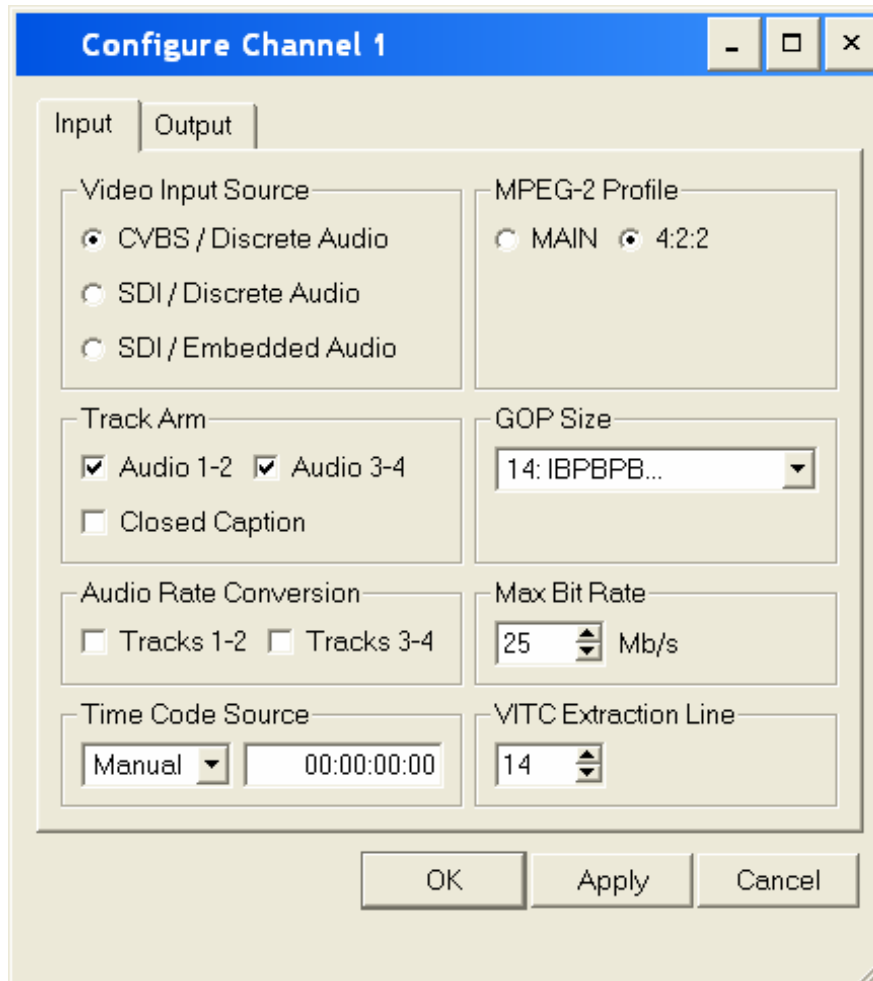


Figure 27: Channel 1 Input Configuration Dialog Window

Input Source

Select either CVBS (composite analog), or SDI (serial digital) for the input source.

Track Arming

The Image Server records video, audio and closed caption information as separate files that comprise a clip. Video is always recorded; select the additional sources you wish to record.

For certain video material such as keys or wallpaper no audio is needed. For analog audio recording, a choice of zero or two audio channels is available. With digital audio, a choice of zero, two, or four channels may be made. Since the Image Server records 24-bit uncompressed PCM, a worthwhile savings of disk-space can be achieved by turning off audio tracks when not needed.

Audio Sample Rate Conversion

The Image Server always records audio at 48 kHz. Select Sample Rate Conversion to convert off-speed digital audio sources to the Image Server's 48 kHz internal clock rate.



Use Sample Rate Conversion with any 48K signal that is not referenced to either the same source as genlock, or the digital outputs of the Image Server.

Bit-for-Bit® Recording & Playback

The recording, storage, and playback of audio program material such as Dolby®-E, Dolby Digital (AC-3), or DTS® requires that upon payout the data stream be identical to the original. Do not use the audio sample rate converters when working with these encoded audio formats.

The Image Server and a Dolby encoder must be supplied with the same genlock signal.

Audio Sync Reference

The audio sample rate is derived from the selected video sync reference. Audio is recorded at a nominal 48K sample rate, so the 0.1% pull-down for 29.97 NTSC is taken into account when generating the audio sample rate for color NTSC. There is no drop frame issue for PAL servers.

Time Code Source

This function selects the time code source for newly recorded clips. A time code value is obtained from the selected input source at the start of a new recording. Choose VITC, LTC, or Manual input source. For manual, enter the desired time value for the first frame of the recording in the Starting Time Code entry field.

The selected time code source value can be viewed in the Channel 1 CVBS Time Code burn-in window when E-E mode is monitoring the input source and no clip is cued. When recording begins, E-E mode switches the monitor from the input to the disk and the Time Code burn-in window shows the current time code position.

MPEG-2 Profiles

Select either Main Profile @ Main Level (4:2:0), or 4:2:2 Profile @ Main Level for the recording.

GOP Structure

GOP structure defines the MPEG Group of Pictures coding as combinations of I, P, and B frames. The allowable combinations are presented in a drop-down list. I-Frame only encoding will produce the least compressed picture and requires the most hard disk space. However, I-frame encoding facilitates frame-accurate editing. For broadcast-quality resolution, I-frame encoding should be considered at 20 or 25 Mb/sec. When frame-accurate edits are required for production work, an I-frame GOP structure should be selected. Very low bit rates should never be employed with I-frame encoding.

Long-GOP video recorded with P and B frames produces superior image quality for a given data rate, compared to I-frame. Most broadcasters go to air with 10 or 12 Mb content, having medium-length GOPs.

Encode Mode

Image Servers employ Variable Bit Rate (VBR) MPEG-2 encoding. For almost all broadcast applications, VBR encoding produces superior results than its alternative, Constant Bit Rate.

Maximum Bit Rates

The range of available bit rates depends upon the MPEG-2 profile selected. In Main Profile @ Main Level, the record bit rate ranges from 2 Mb/s to 15 Mb/s. When the 4:2:2 Profile is selected, the range extends from 2Mb/s to 50 Mb/s.

Output Configuration

Select a channel from the dropdown menu. For Channel 1, select the **Output** tab.

To accept changes made to the configuration dialog box, click **Apply**. Click **OK** to accept changes and close the configuration dialog window. Click **Cancel** to close the window and discard any changes. Changes to the Time Code Burn-in position are effective immediately. Changes to the Audio Slip will be effective when the clip is reloaded.

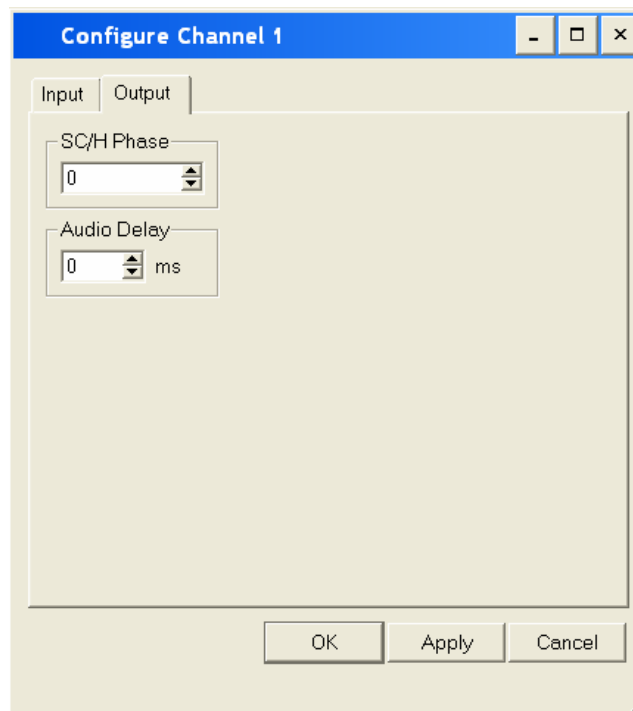


Figure 28: Channel Output Configuration Window

Time Code Burn-In

This area of the dialog window sets the Time Code Burn-In ON or OFF. When it is set ON, choose the display position on the video monitor from the drop-down list.

SC/H Phase

Adjusts the Sub-Carrier/Horizontal phase relationship. Use a vector scope to view the phase relationship and adjust the setting. Changes to the setting are effective immediately without clicking Apply or OK. The adjustment range is $\pm 90^\circ$.



Audio Slip

Audio timing relative to picture output can be configured for audio channels 1-2 and 3-4. The value is set in millisecond (ms) increments, $\pm 1,000$ ms. The setting is applied to a clip when it is loaded for playback.

Hard Disk Management

This Image Servers employ an advanced Serial-ATA controller that manages four high-capacity hard disks operating in a RAID-5 configuration. This design increases system performance, and by storing parity data, helps prevent data loss should a drive fail.

The Image Server brings a high level of reliability to Serial-ATA RAID through a new, switched architecture that exceeds the reliability of SCSI shared-bus storage systems. The earlier shared-bus architecture of SCSI has inherent performance limitations due to arbitration latency, since only one drive may use the bus at a time. Further, a single drive failure can bring the entire storage system down.

By contrast, the Image Server uses a non-blocking switched architecture to isolate the drives from one another. Any drive failure makes that drive unavailable and the rest of the storage system remains undisturbed. In addition, the Image Server uses Advanced Data Protection features, where all drive commands are checked to ensure that no command corruption has taken place over the entire data path.

Some of the Image Server RAID implementation features and benefits include:

- Non-blocking switch technology with RAID 5 parity
- On-board processor minimizes host CPU overhead
- Easy-to-configure arrays
- Dynamic sector repair for robust data protection
- Accelerated RAID-5 writes

About RAID 5

A RAID 5 configuration features the data striping of RAID 0 combined with the parity benefits of RAID 4. Using a simple parity (exclusive OR) function, RAID 5 can tolerate the loss of one drive. Parity information is distributed across all drives rather than being concentrated on a single disk. This avoids throughput loss due to contention for the parity drive. Spare drives can be used to rebuild a failed array.

RAID-5 capacity equals the size of drive times (number of drives -1). In addition, the array's storage efficiency increases with the number of disks; from 66.7 % for 3 drives to 75 % for 4 drives: storage efficiency = (number of drives -1) X (number of drives).

RAID Level 5:
“Independent Access Array with Rotating Parity”
High Data Reliability & Transfer Capacity

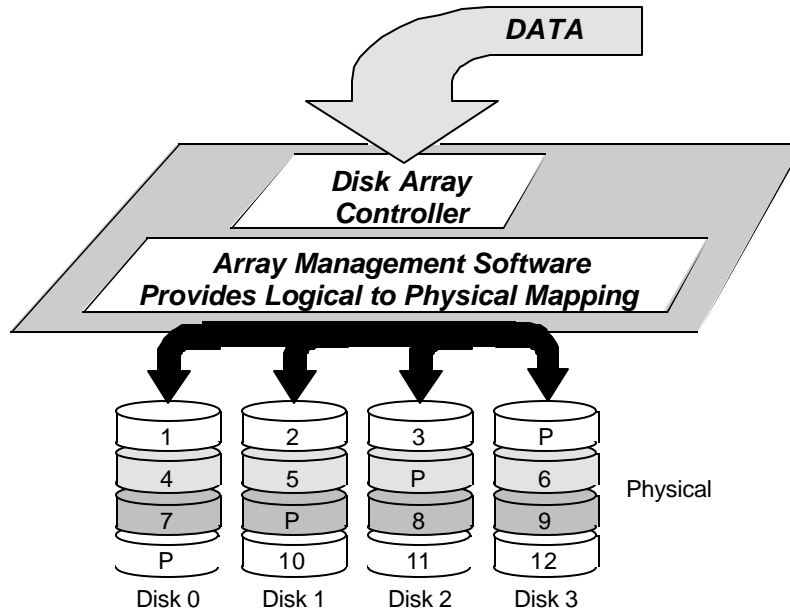


Figure 29: RAID 5 Array Schematic

Improved Write Performance

The Image Server uses new designs to improve RAID-5 write performance for both large sequential and small random transactions. This advanced block caching firmware delivers extremely high performance for RAID-5 write operations.

Managing Disk Arrays

The Image Server’s Disk Array Configuration Utility provides tools for monitoring and managing the disk array. Monitoring and troubleshooting programs automatically check the array, report problems, and provide access to RAID status information and service options.

A single drive fault should not cause data loss, but the drive array is degraded and no longer has storage redundancy. Hence, another disk failure may cause a complete loss of data and system failure. After a drive failure it is strongly recommended that at the earliest time diagnostics be performed, and the server be taken off line while the RAID array is rebuilt.

Error Notification and Repair

The Image Server will notify users in the event of a fault by flashing the front panel **DRIVES** light. A flashing **DRIVES** light can be triggered by a variety of conditions. The first step in response to a flashing light is to open the RAID **CHECK STATUS** window from the On-Screen Start Menu. Click **Start > RAID Status** to launch the Array Configuration Utility.

The RAID **CHECK STATUS** window (Figure 22) displays the current status of the RAID controller and all disks connected to the RAID system. On inspection, you will find the array in one of the following states:

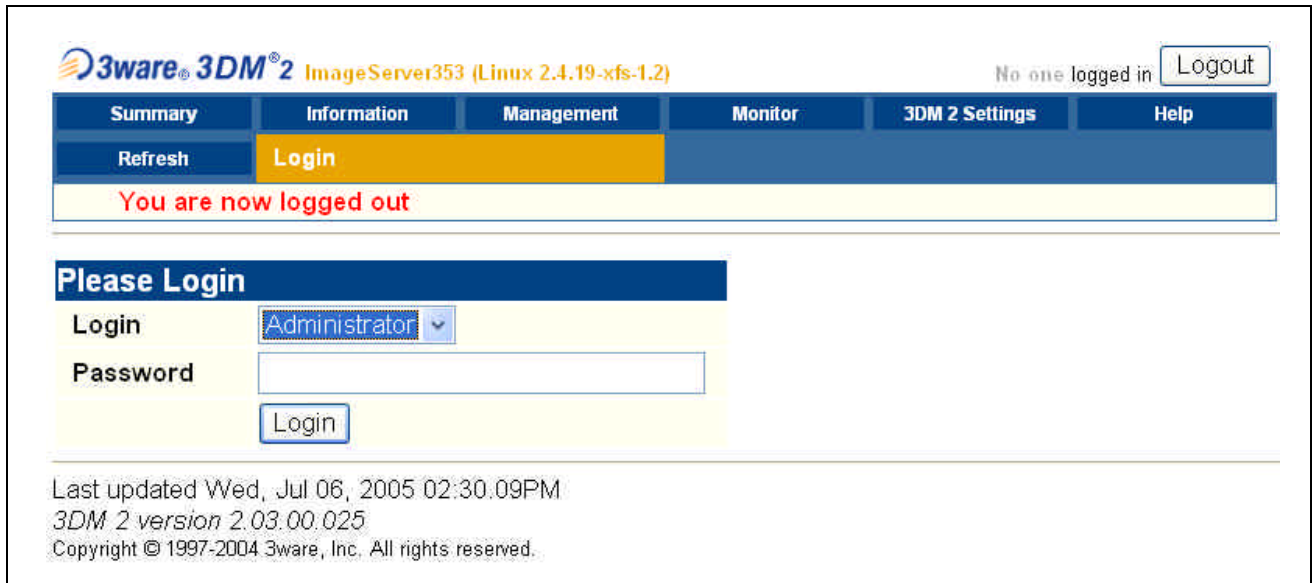
- **OK**, indicated by "OK" for Array Unit 0 and all Ports (drives);
- **Initializing**, indicated by "Initializing" on the Array Unit 0 status line;
- **Degraded**, indicated by "Degraded" on the Array Unit 0 status line;
- **Rebuilding**, indicated by "Rebuilding x%" on the Array Unit 0 status line.

Initializing is the way that the array controller corrects data parity errors that may have occurred because of power loss, incorrect shutdown, or some other data error. Upon detection of a parity error, the controller will automatically start the initialization process as a background task. This task should not interfere with Image Server's ability to record or play clips.

Parity errors may occur if the Image Server loses power, or is improperly shut off. No data will be lost, but the parity reinitialization process may take several hours. NEVER use the rear panel power supply switch to shutdown the Image Server. Shutdown the system only by momentarily pressing the front panel power button or selecting **Start > Shutdown > Shutdown** from the graphic user interface.

A degraded array with a drive listed as "Not In Service" or "Inaccessible" is usually indicative of a permanent drive error, typically a single disk or cable failure, but redundant data will allow normal operations to continue. You may first try to rebuild the array with the existing drive still installed. If the array continues to indicate a failed drive, replace the drive and then rebuild the array. A hard disk array must be repaired using exactly the same drive model and capacity as other drives in the array. Because specific drive model become unavailable as time goes on, 360 Systems recommends that maintenance spares be purchased at the same time as the Image Server.

Log-In to the RAID Utilities



3ware® 3DM® 2 ImageServer353 (Linux 2.4.19-xfs-1.2) No one logged in Logout

Summary	Information	Management	Monitor	3DM 2 Settings	Help
Refresh	Login				

You are now logged out

Please Login

Login Administrator

Password

Login

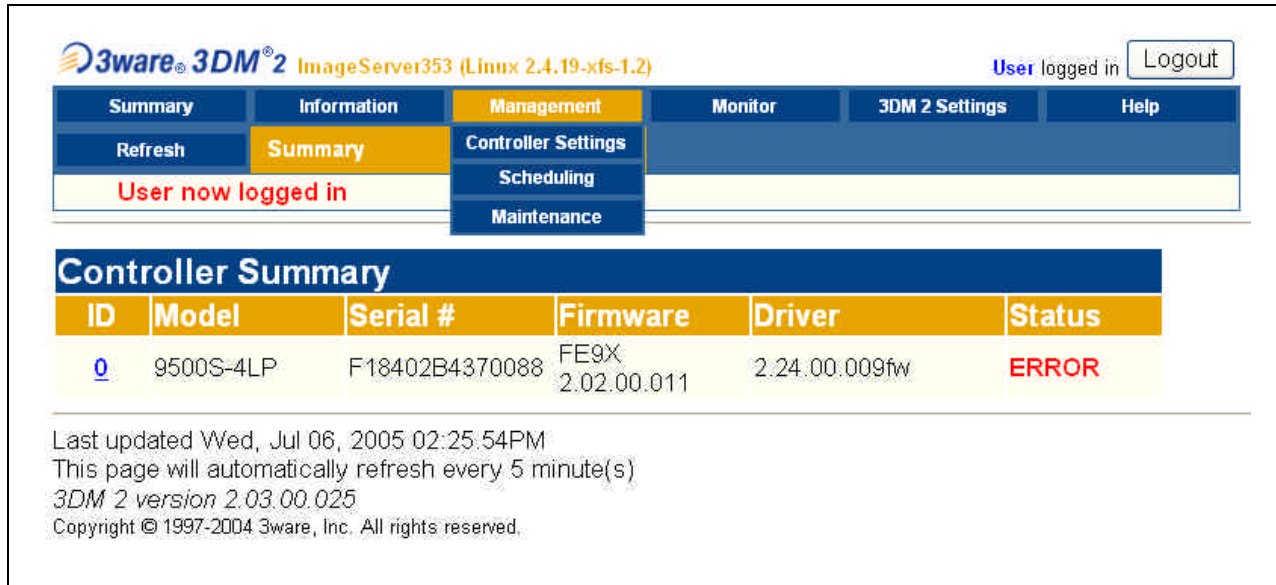
Last updated Wed, Jul 06, 2005 02:30.09PM
3DM 2 version 2.03.00.025
Copyright © 1997-2004 3ware, Inc. All rights reserved.

Figure 30: Log-In to RAID Utilities

To log in to the RAID utilities, perform the following steps. The above window will appear.

- Open the RAID utilities by selecting **START > SYSTEM > RAID STATUS**
- A Security Alert window will pop up and provide information about a security certificate. Select **Yes** to proceed.
- In the **Login** window, select ADMINISTRATOR from the drop down menu.
- In the **Password** window, make no entry. (leave it blank)
- Click the **Login Button** to enter the Login Utilities.
- The Summary screen will be displayed. A message under the **Status** heading may appear. This can be either a **WARNING** or an **ERROR**, depending upon the severity of the problem.

Displaying the Summary Window of the RAID Array



3ware® 3DM® 2 ImageServer353 (Linux 2.4.19-xfs-1.2) User logged in

Summary	Information	Management	Monitor	3DM 2 Settings	Help
Refresh	Summary	Controller Settings			
User now logged in		Scheduling			
		Maintenance			

Controller Summary					
ID	Model	Serial #	Firmware	Driver	Status
0	9500S-4LP	F18402B4370088	FE9X 2.02.00.011	2.24.00.009fw	ERROR

Last updated Wed, Jul 06, 2005 02:25:54PM
 This page will automatically refresh every 5 minute(s)
 3DM 2 version 2.03.00.025
 Copyright © 1997-2004 3ware, Inc. All rights reserved.

Figure 31: Checking Status of RAID Array Through the Summary Window

The RAID controller keeps track of any condition that would adversely affect its reliability. In the event that an error should occur, the *Summary Window* will be helpful in diagnosing the problem.

The above drawing will appear.

- Make note of any error conditions reported.
- Select **MANAGEMENT > MAINTENANCE** from the screen.
- The following screen will provide detailed information about the array status.

Determining the Condition of The RAID Array

The screenshot shows the 3ware 3DM 2 web interface for an ImageServer353 (Linux 2.4.19-x86-1.2). The user is logged in, and the 'Maintenance' tab is selected. A 'Rescan Controller' button is available, with a note: '(This will scan all empty ports for newly inserted drives/units)'. Below this is the 'Unit Maintenance (Controller ID 0)' section, which displays a RAID 5 array with 4 drives and a total capacity of 1.09 TB. The array status is 'DEGRADED'. The drives are listed as follows:

Unit 0	4 drives	RAID 5	1.09 TB	DEGRADED	
Port 0	HDS724040KLSA80	372.61 GB	OK		
Port 1	HDS724040KLSA80	372.61 GB	OK		
Port 2	HDS724040KLSA80	372.61 GB	DEGRADED		[Remove Drive]
Port 3	HDS724040KLSA80	372.61 GB	OK		

Below the table are buttons for 'Verify Unit', 'Rebuild Unit', 'Migrate Unit', 'Remove Unit', and 'Delete Unit'. A warning states: '*Before removing or deleting a unit, make sure there is no I/O on the unit and unmount it'. The 'Available Drives (Controller ID 0)' section shows 'NO DRIVES' and a 'Create Unit' button. At the bottom, it notes the page was last updated on Wed, Jul 08, 2005 02:28:45PM and will refresh every 5 minutes. The 3DM 2 version is 2.03.00.025, and copyright is © 1997-2004 3ware, Inc. All rights reserved.

Figure 32: Report of RAID Array Condition

To replace a failed drive in the RAID control utility, perform the following steps.

- Select the **[Remove Drive]** option next to the DEGRADED drive.
- The **DEGRADED** message next to the drive will change to **NOT PRESENT**.
- If you suspect the drive is damaged, or if a previous Rebuild attempt has failed:
 1. Power down the system.
 2. Replace the failed drive with a drive of identical storage space. Detailed information about how to replace hard drives is on page 110.
 3. Restart the system.
 4. Repeat the steps described earlier in this chapter – up to this point – then continue...
- Click on the **Rescan Controller** button to identify available drives. The following window will appear:

Rebuilding a RAID Array

3ware® 3DM[®] 2 ImageServer353 (Linux 2.4.19-xfs-1.2) Administrator logged in Logout

Summary Information Management Monitor 3DM 2 Settings Help

Refresh Maintenance Select Controller Controller ID 0 (9500S-4LP)

Rescan found the following unit(s): [none] : Found the following drives(s): [none]

Rescan Controller (This will scan all empty ports for newly inserted drives/units)

Unit Maintenance (Controller ID 0)

Unit 0	4 drives	RAID 5	1.09 TB	DEGRADED
Port 0		HDS724040KLSA80	372.61 GB	OK
Port 1		HDS724040KLSA80	372.61 GB	OK
--		--	--	NOT PRESENT
Port 3		HDS724040KLSA80	372.61 GB	OK

Verify Unit Rebuild Unit Migrate Unit Remove Unit Delete Unit

*Before removing or deleting a unit, make sure there is no I/O on the unit and unmount it

Available Drives (Controller ID 0)

<input checked="" type="checkbox"/> Port 2	HDS724040KLSA80	372.61 GB	OK	[Remove Drive]
--	-----------------	-----------	----	--------------------------------

Create Unit

Last updated Wed, Jul 06, 2005 03:20:25PM
 This page will automatically refresh every 5 minute(s)
 3DM 2 version 2.03.00.025
 Copyright © 1997-2004 3ware, Inc. All rights reserved.

Figure 33: Rebuilding a RAID Array

To rebuild the RAID drive array, perform the following steps:

- Select the **Unit 0** and **Port 2** checkboxes.
- Select **Rebuild Unit**. A pop up window will ask for confirmation. Re-select the **Port 2** checkbox in the pop up window, then hit **OK** to begin re-building the array.
- The rebuild process will begin.

The Maintenance Window – Rebuild Progress

3ware 3DM[®]2 ImageServer353 (Linux 2.4.19-xfs-1.2) Administrator logged in Logout

Summary Information Management Monitor 3DM 2 Settings Help

Refresh Maintenance Select Controller Controller ID 0 (9500S-4LP) v

Rescan Controller (This will scan all empty ports for newly inserted drives/units)

Unit Maintenance (Controller ID 0)

Unit 0	4 drives	RAID 5	1.09 TB	REBUILDING 17%	
Port 0	HDS724040KLSA80	372.61 GB	OK		
Port 1	HDS724040KLSA80	372.61 GB	OK		
Port 2	HDS724040KLSA80	372.61 GB	DEGRADED		[Remove Drive]
Port 3	HDS724040KLSA80	372.61 GB	OK		

Verify Unit Rebuild Unit Migrate Unit Remove Unit Delete Unit

*Before removing or deleting a unit, make sure there is no I/O on the unit and unmount it

Available Drives (Controller ID 0)

NO DRIVES

Create Unit

Last updated Wed, Jul 06, 2005 03:51:58PM
 This page will automatically refresh every 5 minute(s)
 3DM 2 version 2.03.00.025
 Copyright © 1997-2004 3ware, Inc. All rights reserved.

Figure 34: The Maintenance Window Shows Rebuild Progress

The Maintenance window above will appear.

- Rebuild progress is tracked in top of the drive status column (**REBUILDING 17%** in this example).
- The rebuild progress will automatically update every 5 minutes. Click the refresh button on your browser window for an immediate update.
- When complete, 100% will be shown on the **MAINTENANCE** menu.

Replacing Hard Drives

The Image Server hard disk drives have been factory tested and configured into a RAID 5 array. Each drive is numbered (0-3) and must be attached to the matching numbered data cable. Drive bays are also numbered.



Please read *Removing the Front Panel* on page 103 for instructions on accessing the hard drive bays. Detailed information about how to replace hard drives is on page 110.



Network File Transfers

Apart from recording and playing program content through composite video and SDI connections, the Image Server can also act as an FTP server, delivering program material across the room or across the country. Its Gigabit Ethernet port is standard equipment, and provides reliable high-speed transfers at much lower cost than Fibre Channel.

The actual network transfer rate depends on the number of video streams also being played, and their bit rate. To ensure that video recording and playback can always take place, the Image Server gives network transfers a lower priority than video. In practice, broadcast content encoded at 12 Mb/sec should transfer at a 5X rate, even while the server is playing video.

MXF File Transfers

The Image Server supports FTP-based import and export of files in MXF format. The applicable standards are SMPTE 377M, 378M and SMPTE 381M. Operational Patterns 1a and 1b files are supported.

Network Operations

FTP transfers to and from the Image Server are managed from an FTP client file transfer manager program running on a Windows® or Macintosh® computer. This approach provides a rapid way to execute drag-and-drop file transfers; it can also manage many Image Servers at once and does not tie up the Image Server GUI, which may already be in use. Third party FTP manager programs are readily available for download through the Internet.

FTP programs may also be used to move recorded or edited material between an Image Server and network attached storage (NAS) or a DVD-ROM library.

Using the Image Server in a Large Network

From a networking or system integration viewpoint, the Image Server appears as a normal drive to an FTP server in any size network, with the exception that it may only send, receive, or store video files that are compatible with the Image Server.

Transfer of Edited Segments

The Image Server sets MARK-IN and MARK-OUT points in a clip as “edit pointers.” For all edit operations within a given Image Server, these pointers produce “virtual edits” that save disk space, and the time it would take to re-write the marked region as a new file.

It is clearly impractical to transfer a long file to obtain a 30-second virtual clip marked within it. Therefore, the Image Server transfers *only* the region between In/Out points, and not the entire

file. If you want to transfer the entire recording, be sure that the In/Out markers are set to the beginning and end of material before the transfer.

To maintain the identity of the transferred clip, the time code references for its Mark-In/Out points are maintained, as shown in *Figure 35: Result of a network file transfer*.

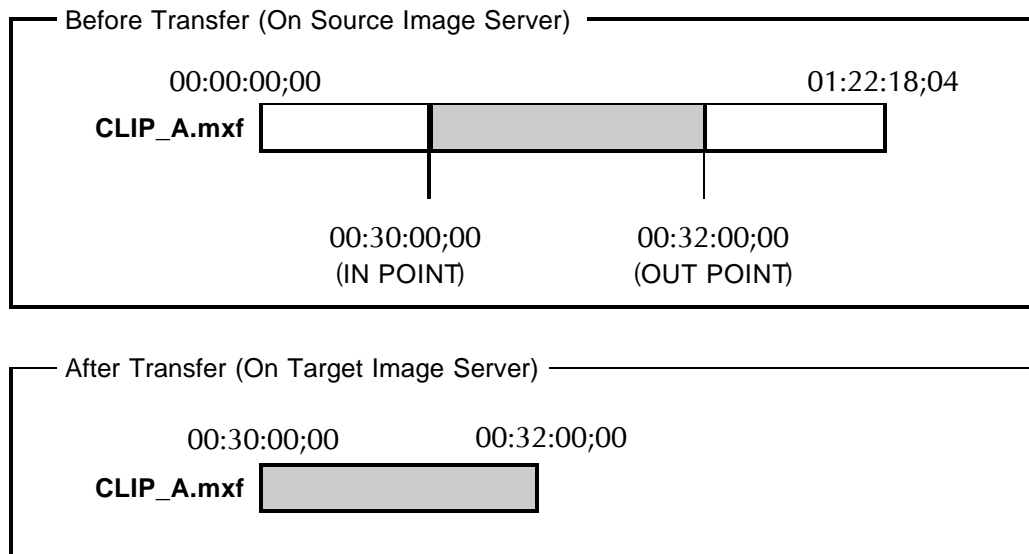


Figure 35: Result of a network file transfer

File Sizes Reported in Listing

The size of a clip reported in the file listing is the amount of video and audio data included between the In/Out points.

Overwriting Files

It is the responsibility of the client application (Windows Explorer, FlashFXP, etc) to ask the user if they want to overwrite a file.

Interrupted and Resumed Transfers

If a transfer is interrupted (for example, by a dropped connection) the amount of the file that has been transferred is kept on the target system. Resumption of a partial transfer is planned for a future software release.

System Security

The Image Server can share program content on a network with other equipment to. It appears as an anonymous FTP server, and is accessible to anyone on the network. As with all servers, it is essential to use it behind a properly configured firewall.



FTP File Transfers

For standard FTP transfers, the Image Server will recognize the following file formats:

TARGA (.tga)

During transfer, the Image Server will split the TARGA file into a Fill frame and a Key (Alpha) frame. These two frames will each be converted to MXF MPEG-2 files, one frame in length.

DV Stream (.dv)

These are 'elementary' DV files containing a single stream of multiplexed audio and video. The Image Server will recognize and maintain .dv extensions on DV stream files, allowing transfer of .dv files between Image Servers and graphics workstations without modification.

MPEG-2 (.mp2, mpg, mpeg, m2v)

The Image Server will ingest valid MPEG-2 program or elementary streams. The server's ingest application will recognize a program stream that encapsulates a single MPEG-2 video stream, and up to 2 stereo pairs of 16- or 24-bit, 48kHz, uncompressed audio.

MXF - Material Exchange Format (.mxf)

Transfer of MXF files between compatible products is the preferred method of file interchange to-and-from an Image Server. The server supports ingest and playout of MPEG-2 files based on SMPTE 377M, 378M and SMPTE 381M, Operational Patterns 1a and 1b.

AVI Files (.avi)

An AVI file is a container that encapsulates and describes a type of interleaved audio and video. The Image Server will import Type 1 .avi files (a single stream of multiplexed audio and video) containing DV format video and 48K uncompressed audio. During ingest of .avi files, the server will convert the file into a DV stream (.dv) for storage and future transfer.

Gigabit Ethernet Hardware

A Gigabit Ethernet (RJ-45) connector labeled NET-1 is located on the rear panel for conventional network access. No hardware settings are available or needed, as Gigabit Ethernet automatically negotiates port speed. Connection speed is shown by LEDs on the network connector. The NET-1 port also automatically configures transmit and receive connections, and does not need a “crossover” cable when connecting directly from one server to another.

Label	Indication	Meaning
ACT/LNK (Left)	Green on	The port is connected to a valid link partner
	Green flashing	Data activity
	Off	No link
10=OFF 100=YELLOW 1000=GREEN (Right)	Off	10 Mbps
	Yellow flashing	100 Mbps
	Green	1000 Mbps

Redundant Server Connection

The Gigabit Ethernet port labeled NET-2 on the Image Server is for redundant (mirrored) operation of two Image Servers. It does not use FTP protocol, and no connection should be made from it to other equipment.

Gigabit Ethernet Cable Quality

The high data rates generated by Gigabit Ethernet require high-quality cable designed for this application. Low-quality network cables can result in high error rates and lower transmission speed. For Gigabit operation, standard “CAT 5” cable should not be used.

New Category 5e (enhanced) cables ensure maximum transfer rates, and should be used as the minimum standard. Category 6 cable is a more recent product, designed for applications where longer cable runs are required.

Configuring Network Settings

The Image Server provides a number of user settings that configure it for use as a practical network. These will be found on the GUI System Network tab shown below.

The NET-1 Ethernet port on the Image Server has a unique IP Address. In this way, each Image Server can be identified on the network. It also means that there is only one IP Address for a given volume of data.

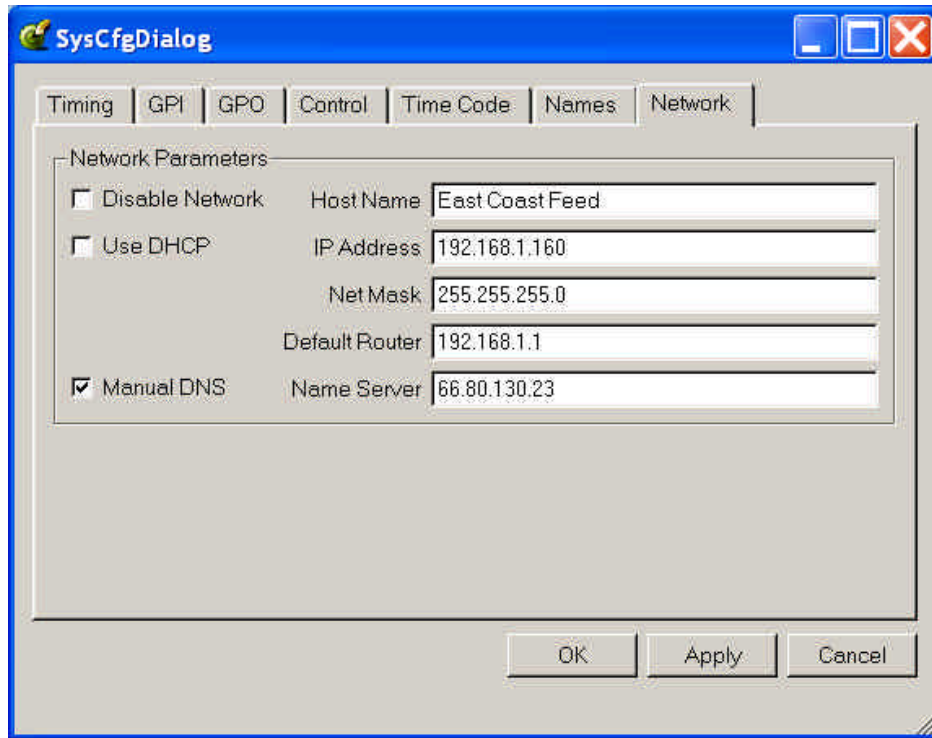


Figure 36: Network Configuration Tab

Network Settings Tab

Use the Image Server graphic user interface to configure network communication settings.

From the Main Menu selection bar at the top of the screen, select **CONFIGURE > SYSTEM > NETWORK**.

Each Image Server is shipped with a unique default network Host Name and IP Address. Qualified network engineers may change these configurations to suit your specific network environment. Factory defaults for networking are:

- Network enabled
- Use DHCP
- Use automatic DNS

Disable Networking Checkbox

This selection turns the network OFF or ON. The default is ON, but can be turned off to deny access to/from the network for security purposes.

Use DHCP Checkbox

Enabling DHCP will configure the network interface automatically.

If the DHCP box is not selected, the user may then manually enter assignments in the following windows:

- Host Name
- IP Address
- Net Mask
- Default Router

Host Name may be a fully qualified domain name, such as edit1.mydomain.com. All other manually configured addresses must be properly formatted IP addresses.

Manual DNS Checkbox

When using DHCP, the DNS name resolution is usually configured automatically. Enabling Manual DNS configuration requires that a DNS server address be supplied for name resolution.

Saving Network Configuration

Click on OK, APPLY, or CANCEL to accept or abandon new entries. Changes will not take effect until the Image Server is powered off and on.


Maintenance

Fault Diagnostics

Front Panel Indicators

The five LED indicators on the front panel are used to diagnose server fault conditions. The meaning of each indicator is noted in the following table. During normal operation, all five indicators will be on.

GENLOCK	OFF indicates that the Genlock setting in the System menu is "Internal" FLASHING indicates that Genlock is selected in the System menu, but there is no signal, or an invalid signal, at the GENLOCK input connector.	Check the Genlock setting in the On-Screen System menu. Check the Genlock cable connections or signal.
POWER	FLASHING indicates that there is a fault in the system power supply.	Shut down the Image Server and contact 360 Systems Customer Support for further hardware diagnosis.
FANS	FLASHING indicates that there is a fault of the internal chassis fan.	Check the chassis fan operation. Replace if necessary. Do not run the Image Server without a working fan.
DRIVES	FLASHING indicates that there is a fault in the system RAID array.	Check the RAID array status using the utility under START > RAID STATUS.
SYSTEM	FLASHING indicates that the CPU fan is running slow, or stopped; or that the CPU temperature or voltage is not within manufacturer's specification.	Shut down the Image Server and contact 360 Systems Customer Support for further hardware diagnosis.

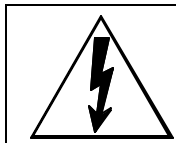
	Repairs should be performed only by qualified electronics technicians.
---	--

Gigabit Ethernet Indicators

The Gigabit Server Adapter card has the following indicator lights:

Label	Indication	Meaning
ACT/LNK (Left)	Green on	The port is connected to a valid link partner
	Green flashing	Data activity
	Off	No link
10=OFF 100=YELLOW 1000=GREEN (Right)	Off	10 Mbps
	Yellow flashing	100 Mbps
	Green	1000 Mbps

Access to Components



Be certain to shut down the Image Server, turn off the rear panel power switch and disconnect the power cord before opening the unit for service.

The following sections provide instruction on disassembly and re-assembly for maintenance.

The front panel is removed to access the internal CD-ROM drive (for system program updates), or to service the hard drives.

The top cover is removed to access the analog/digital audio selection jumpers, or to service an I/O card, the system board, or power supply.

Removing the Front Panel

The front panel is easily removed for access to the CD-ROM drive, the four disk drives, or for removing the server from an equipment rack. Using a coin or a flat-blade screwdriver, unscrew the two large panel fasteners on the left and right sides of the face panel. Hold the panel in place while undoing the screws. Since the loosened screws are captive, you may use them to pull the panel away from the chassis.

To re-install the front panel, tuck all wires into the chassis and move the face panel into position. Screw the front panel fasteners back into the chassis. Tighten the front panel access screws with a screwdriver.

Removing the Top Cover

Using a No. 2 Philips head screwdriver, unscrew the three 6-32 Philips head screws attaching the top cover to the rear panel. Slide the cover back until it is clear of the front panel, and then lift it off.



To re-install the top cover, set the cover on top of the chassis and slide the cover forward until its front pins engage the front panel. Secure the cover to the rear of the chassis with the three 6-32 screws.

General Handling Precautions

ESD Precautions



Observe electrostatic discharge (ESD) precautions to avoid damaging static-sensitive components when handling any PC card or disk drive.

When the case of your server is open and its internal parts are exposed, do not touch any internal part without first grounding yourself to the chassis.

Always wear a ground strap or work on an ESD-protective mat.

DO NOT remove components from protective packaging until you are properly grounded.

Handle printed circuit boards by their edges or by the metal bracket.

Don't touch any pin, contact, lead or component on the printed circuit boards.

Keep disk drives in their anti-static package until installed in the server.

Mechanical Concerns

Be careful when installing I/O cards into your system. Excessive force can damage the PC boards, cables, hard drives or the motherboard.

Be sure each board is aligned with its slot in the mating connector before installing. Use care to not flex any PC boards.

Interface cable connectors must be mated carefully. Use care to not bend any of the pins. The connectors provided are keyed to prevent upside-down insertion.

Interface cables are fragile and must not be pinched. Ensure that their dress does not restrict airflow from fans or heat sinks within the enclosure.

Prior to installation, keep disk drives stored in a foam-lined protective carton to protect them from physical damage.

Installing/Removing I/O Cards

Follow the preceding instructions to remove the top cover. The I/O cards are accessible from the top of the chassis. Generally, I/O cards can be extracted or installed with a No. 2 Phillips screwdriver. Each I/O card is held in place by one or two 6-32 X ¼" pan head Phillips screws on the rear panel of the chassis.

Low Profile PCI Cards

Remove the 6-32 x ¼" pan head Phillips screw holding the I/O card to the rear panel. Pull the I/O card from its slot. Reverse the procedure to install a card.

Video I/O Card

Remove the 6-32 x ¼" pan head Phillips screw holding the video card to the rear panel. The video I/O card is also held by a support bracket near the front panel. Remove the 6-32 x ¼" pan head Phillips screw holding the bracket to the inside wall of the chassis.

While supporting the riser card, gently pull the video card from the riser card. When the video card is clear of the PCI riser connector, move the card toward the front of the Image Server until the video connectors are clear of the rear panel. Lift the video card from the chassis. Unplug the 50-pin ribbon cable from the video card. Immediately place the video card into a conductive storage bag to protect it from electrostatic discharges.

Reverse the procedure to install a card. After all the screws are reinstalled, check that the riser card, RAID card, and video card are all seated properly in their PCI connectors.

RAID Controller Card

Unplug the four Serial-ATA cables from the RAID card.

Remove the 6-32 x ¼" pan head Phillips screw holding the RAID card to the rear panel. Gently pull the card from its slot. Immediately place it in a conductive storage bag for protection from electrostatic discharge that can damage it.

Reverse the procedure to install a card. Be certain to install the Serial ATA cables into the correct RAID card connectors. The cables are marked with connector numbers to match the numbers appearing next to each RAID card connector. If these cables are not connected correctly, the data in the RAID array will be destroyed.

Accessing the Motherboard

There are no user-configurable options to set on the main system board. If you suspect that the system board is not operating properly, consult with 360 Systems before proceeding. DO NOT undertake any repairs on the motherboard.



Analog/Digital Audio Selection

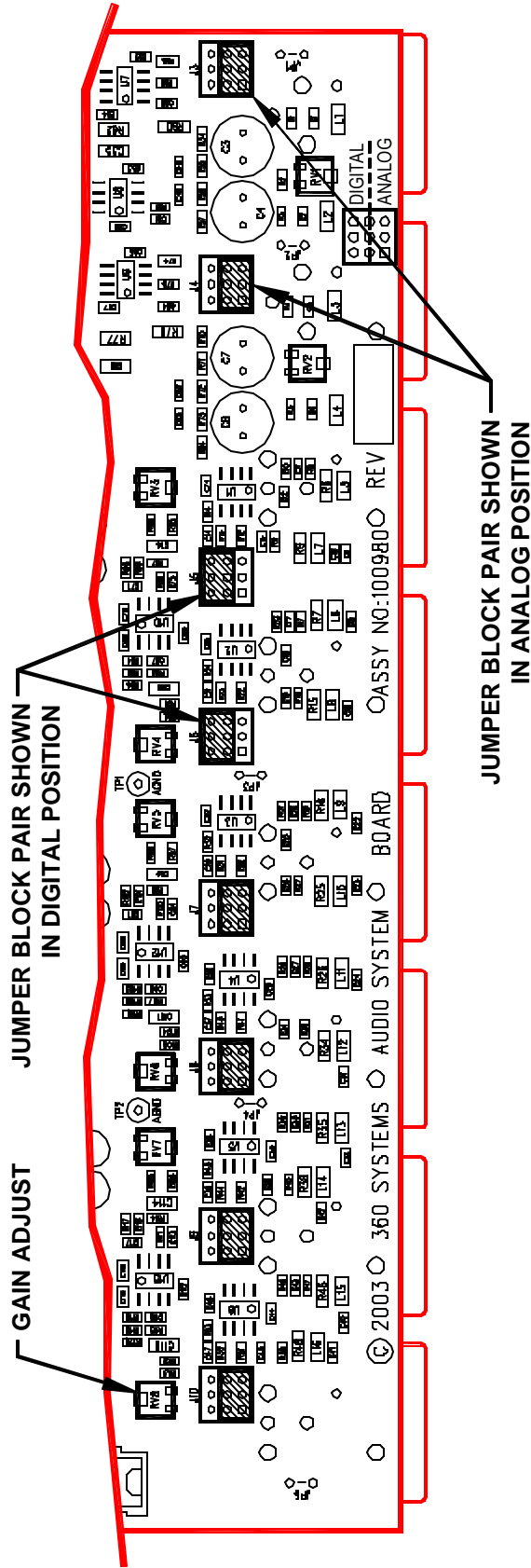


Figure 37: Audio Hardware Setup

Both jumpers for each channel (Left & Right, or Main & Aux) must be set together, either analog or digital.

SETTING AND CALIBRATION REFERENCE DESIGNATIONS

Connector	Main 3 L Main 3 L/R	Main 3 R Aux 3 L/R	Main 2 L Main 2 L/R	Main 2 R Aux 2 L/R	Main 1 L Main 1 L/R	Main 1 R Aux 1 L/R	Main In L Main In L/R	Main In R Aux In L/R
Jumper	J10	J9	J8	J7	J6	J5	J4	J3
Trimmer	RV8	RV7	RV6	RV5	RV4	RV3	RV2	RV1

Audio Level Calibration

The input gain and output gain of the analog audio circuits are factory calibrated to a +4 dBu standard. Each circuit includes a trim pot with a range of approximately ± 2.5 dB. The following procedures may be used to calibrate these for unity gain. Each trim pot is located above the XLR connector with which it is associated. Refer to the preceding drawing (Figure 27) for the location of trim pots and jumper blocks referred to in the calibration procedures.

Calibration Procedure

This procedure assumes that the technician is fully familiar with test procedures employing the Audio Precision® test equipment, or its equivalent.

1. Position the jumper block J5 and J6 for Channel 1 output to obtain an analog output.
2. Play the test clip titled zTONE present on the Image Server disk. This stereo clip is recorded at a level equivalent to a +4 dBu output level.
3. While observing the output level of audio Channel 1 Left, adjust trimmer RV4 until a level of exactly +4.00 dBu is obtained.
4. Repeat this procedure for audio Channel 1 Right, while adjusting trimmer RV3, and also for each subsequent audio channel using its associated trim pot.

Having established accurate gain settings for all analog audio outputs in steps 1 through 3 above, calibrate the Image Server's input gain as follows:

5. Using the graphic user interface, place server Channel 1 in the E-E mode, so that an input signal will appear at its output.
6. While observing the output level of audio Channel 1-L, apply a 1 kHz sine wave from the audio generator to audio Input 1-L.*
7. Adjust input trimmer RV2 until a level of exactly +4.00 dBu is obtained at the output of Channel 1L.
8. Repeat this procedure for audio Input 1-R, making the gain adjustment with input trimmer RV1.

The preceding steps establish a gain of unity through the server.

* In the absence of a generator, use the calibrated outputs of Channel 2 playing zTONE to feed the inputs.



Alternate Calibration Procedure

If the calibration test clip titled z1K_TONE is not found on the Image Server's disk, it is still possible to accurately calibrate the audio channels.

1. Position the jumper block J5 and J6 for Channel 1 output to obtain a digital output.
2. Using the On-Screen graphic user interface, place server Channel 1 in the E-E mode, so that an input signal will appear at its output.
3. Use the audio generator to apply a 1 kHz sine wave at a level of +4 dBu to analog audio Input 1-L.
4. While observing the digital output level of audio Channel 1-L, adjust input gain trim pot RV2 until a level of -20 dBFS is obtained. (+4 dBu is 20 dB below full scale, which is +24 dBu; therefore it reads 20 dB below full scale or Fs.)
5. Repeat steps 2 through 4 for analog audio Input 1-R, while adjusting input gain trim pot RV1.

The server's input gain is now calibrated. It remains to calibrate each analog output for unity gain using the following procedure:

6. Position all audio output jumper blocks to obtain analog outputs.
7. Using the graphic user interface, verify that server Channel 1 is in E-E mode, so that an input signal will appear at its output.
8. Apply a 1 kHz sine wave at a level of +4 dBu to analog audio Input 1-L.
9. While observing the output level of audio Channel 1-L, adjust output gain trim pot RV4 until a level of +4 dBu is obtained.
10. While observing the output level of audio Channel 1-R, adjust output gain trim pot RV3 until a level of +4 dBu is obtained.
11. Make a 1-minute clip of the 1 kHz sine wave at a level of +4.00 dBu. Save this clip for future use in calibrating the server.
12. Play this clip from Channel 2 and repeat steps 9 and 10 to adjust the gain of the left and right outputs.
13. Play the clip created in step 11 from Channel 3 and repeat steps 9 and 10 to adjust the gain of the left and right outputs.

The server's output gains are now calibrated, and the entire sequence of the preceding steps have established a gain of unity through the server.

Another method is to use digital input with a digital sine wave of -20dBFS to calibrate analog outputs 1 & 2 and create the reference clip.

Program Updates via CD-ROM

The Image Server operating system and On-Screen User Interface programs can be updated by the user via the internal CD-ROM drive. Program updates will be made available by 360 Systems from time to time. The current software version may be determined by looking in the On-Screen program **About** box, or by pressing the F1 key.

To install a program update, follow these instructions. Please read them completely before beginning.

1. Remove the Image Server front panel. The internal CD-ROM drive will be seen at the left front of the server.
2. With the Image Server powered on, press the CD eject button on the drive. The drawer will open a short distance. Gently pull the drawer open and insert the CD-ROM disk, printed side up. Push the drawer closed until it latches.
3. Press the front panel power switch briefly to shutdown the Image Server.
4. Wait 5 seconds, then press the front panel power switch again to boot from the CD.
5. The Installer menu provides a choice to Update the Image Server operating system, begin a new complete install, or cancel the install.
 - Choose UPDATE if you want to keep the video and audio clip files that exist on the Image Server. Use this selection for all normal software updates.
 - Choose NEW only if you want to partition and reformat the drive array, and install the new operating system.

IMPORTANT! Using the NEW option will destroy all video and audio files on the Image Server. For normal software upgrades, use the UPDATE option instead of NEW.

6. The message, "Please wait while Image Server is being installed" will appear with an activity indicator. When installation is complete, the server will automatically reboot from its hard disk array, and display the usual copyright notice while it is starting up. It will also release the CD drawer. Remove the CD. Never leave it in the CD drive.
7. Replace the front panel. Tighten the two large front panel access screws.

If a disk cannot be ejected because the system is not responding or is powered off, the CD-ROM drawer can be released by inserting a paper clip into the small hole on the front of the drive.



Replacing a Hard Drive

Generally, the only time that a hard drive should be removed from the disk array is when the drive array diagnostic software identifies a permanent fault. In this case, the front panel **DRIVES** LED will blink. Use the hard disk management tools to verify that a drive is at fault. The application monitors many things about the array and individual drives, and will clearly indicate whether a drive has failed.

Each hard drive bay is numbered 0 through 3, as are the drives. If for any reason one or more drives have been removed, they must be reinstalled in a bay whose number matches the drive. Installation in the wrong location will damage data stored on all drives.

1. Turn system power OFF with the front panel button. After it has shut down, turn off the AC power switch and unplug the AC power cord.
2. Remove the front panel as described above.
3. Unscrew the holding plate from the front of the drive sub-chassis.
4. Disconnect the power and Serial ATA data cable from the drive, and remove it from the drive bay.
5. Replace the drive, fasten the holding plate in place, and reattach drive cables. Note that the data cables are numbered; re-attach them to the same drive location from which they were removed.
6. Replace the front panel and tighten the two large screws.
7. Replace the AC power cord and turn on the rear panel AC switch.
8. Turn the system ON using the front panel button and check the RAID array status.
9. Check for correct operation of the server.

NOTE: All drives in the RAID array must be identical.

Factory Repair Policy

A video server being returned under warranty shall be sent to 360 Systems, freight prepaid, in the original or equivalent packaging. Call 360 Systems for a return authorization number *before* returning a product.

Use the following address for shipping and correspondence. 360 Systems' offices are open Monday through Friday, from 8:30 AM to 5:00 PM, Pacific Time.

360 Systems
Customer Service Dept.
31355 Agoura Road
Westlake Village, CA 91361

Telephone (818) 991-0360
Fax (818) 991-1360
E-mail info@360systems.com
Website www.360systems.com

Regulatory Certifications

Safety

The Image Server was tested by Underwriters Laboratories and found to comply with the following safety standards:

EN 60950, 3rd Edition, dated December 1, 2000, Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.

Laser Compliance

The CD-ROM device used in this product is a Class 1 certified laser product. Operating this product outside specifications or altering its original design may result in hazardous radiation exposure, and may be considered an act of modifying or new manufacturing of a laser product under U.S. regulations contained in 21 CFR Chapter 1, subchapter J or CENELEC regulations in HD 482 S1. People performing such an act are required by law to re-certify and re-identify this product in accordance with provisions of 21 CFR subchapter J or distribution within the USA, and in accordance with CENELEC HD 482 S1 for distribution within countries using the IEC 825 standard.

Laser Safety

Laser safety in the United States is regulated by the Center for Devices and Radiological Health (CDRH). The laser safety regulations are published in the "Laser Product Performance Standard," Code of Federal Regulation (CFR), Title 21, Subchapter J.

The International Electrotechnical Commission (IEC) Standard 825, "Radiation of Laser Products, Equipment Classification, Requirements and User's Guide," governs laser products outside the United States. Europe and member nations of the European Free Trade Association fall under the jurisdiction of the Comité Européen de Normalization Electrotechnique (CENELEC).

Radio Interference Compliance

Radio Interference (USA)

WARNING: This equipment has been tested and found to comply with the limits for Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction's manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate this equipment.



It is suggested that the user use only shielded and grounded cables to ensure compliance with FCC Rules.

FCC Emission Limits

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

Radio Interference (Canada)

English: This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Français: Cet appareil numérique de la classe A respecte toute les exigences du Reglement sur le matériel brouilleur du Canada

Product Warranty and End-User License Agreement

Limited Warranty

This product is warranted to the original purchaser against defects in material and workmanship for a period of one year from the date of original purchase. This warranty covers parts and labor and is effective when the product is used without alteration for the purpose intended by 360 Systems. This warranty excludes products with modified or unauthorized software, that have been subject to misuse or neglect, that have been modified, repaired improperly or by unauthorized personnel, damaged by rough handling, abuse, improper operation, excessive temperature, lightning strike, static electricity, electrical surges or other electrical system malfunctions, improper or inadequate maintenance or care and that have been subject to use of unauthorized or non-conforming accessories or attachments. This warranty also excludes normal wear and deterioration occasioned by the use of the product.

If part of the product is defective, the entire product must be returned along with the original purchase receipt or other evidence of purchase and a description of the defect to 360 Systems, 31355 Agoura Road, Westlake Village, California 91361. Upon receipt, its condition will be verified, and if the product qualifies for warranty coverage, 360 Systems will, at its option, repair or replace the product without charge. In the case of replacement, if the replacement for a defective product is no longer available, 360 Systems will replace it with a similar product or, if not available, a product of equal value.

Disclaimer and Limitation of Liability

The liability of 360 Systems under the foregoing warranty is limited solely to the repair or replacement of defective material or workmanship and does not include any expense related to the shipment of the product to or from 360 Systems or compensation for any inconvenience or loss of use of the product while it is being repaired or replaced.

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Some states do not allow the exclusion or limitation of incidental or consequential damages under certain circumstances, so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

End User License Agreement

For Image Server Software

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6. You may terminate the license granted in Section 1 of this Agreement at any time by destroying or erasing your copy of the Software. Company may terminate this Agreement immediately and without notice if you fail to comply with any term or condition of this Agreement. In the event of termination of this Agreement, all the sections of this Agreement will survive except for Section 1.
7. This Agreement shall be governed by and construed in accordance with the laws of the State of California, U.S.A., without reference to conflicts of laws provisions or the 1980 U. N. Convention on Contracts for the International Sale of Goods and, as to matters affecting copyrights, trademarks and patents, by U.S. federal law. Any dispute with respect to this Agreement shall be brought and heard either in the California state courts located in Los Angeles County, California, or the federal district court for the Central District, Western Division, located in Los Angeles, California. In such event, the parties to this Agreement each consent to the *in personam* jurisdiction and venue of such courts. The parties agree that service of process upon them in any such action may be made if delivered in person, by courier service, by telegram, by facsimile or by first class mail, and shall be deemed effectively given upon receipt.
8. This Agreement sets forth the entire agreement between You and Company pertaining to the licensing of the Software, and supersedes in its entirety any and all written or oral agreements previously existing between the parties with respect to such subject matter. If any provision of this Agreement is held invalid or unenforceable, such provision shall be revised to the extent necessary to cure the invalidity or unenforceability, and the remainder of this Agreement shall continue in full force and effect. In the event of any conflict between any provision of this Agreement and applicable law, the provisions of this Agreement affected shall be modified to remove such conflict and permit compliance with such law, and as so modified this Agreement shall continue in full force and effect. This Agreement may not be assigned without the consent of Company.

Appendix A

Connector Specifications

Audio XLR-3 Connector Pinout

Signals appearing on the XLR connectors are determined by the setting of the internal Analog/Digital Audio Selection jumpers.

Pin	BALANCED ANALOG	AES/EBU DIGITAL
1	SHIELD (FRAME GROUND)	SHIELD (FRAME GROUND)
2	" + " OR HOT	DIGITAL +
3	" - " OR COMMON	DIGITAL -
SHELL	FRAME GROUND	FRAME GROUND

Serial Control Connector Pinout

Pin	EIA-422, DB9-F Connector
1	GND
2	Transmit A (TX-)
3	Receive B (RX+)
4	GND
5	N/C
6	GND
7	Transmit B (TX+)
8	Receive A (RX-)
9	GND
Shell	Frame ground



BNC Connectors

The following note applies to all video, LTC, and Genlock connectors:

- A BNC connector used as an output will have a 75-ohm source impedance.
- A BNC connector used as an input will have a fixed 75-ohm termination.

GPI Connector

General purpose control inputs (GPI) may be applied to the GPI port, which is a DB-25-F connector. These inputs are optically isolated from the Image Server circuitry; individual floating returns are provided. +5 volts may be sourced from pins 21 or 22, or provided from an external source. Current limiting devices are provided within the Image Server.

General purpose status outputs also appear on the GPI connector. Open-collector outputs are provided as status outputs, and may be used to drive an external LED or control input.

Refer to the connector pin-out table and partial schematic, following.

GPI Connector Pinout

Pin	Signal	Pin	Signal
1	GPI 1	14	GPI 1 RTN
2	GPI 2	15	GPI 2 RTN
3	GPI 3	16	GPI 3 RTN
4	GPI 4	17	GPI 4 RTN
5	GPI 5	18	GPI 5 RTN
6	GPI 6	19	GPI 6 RTN
7	N/C	20	N/C
8, 9, 10	GND	21, 22	+5V SOURCE (200MA MAX)
11	GPO 2	23	GPO 1
12	GPO 4	24	GPO 3
13	GPO 6	25	GPO 5

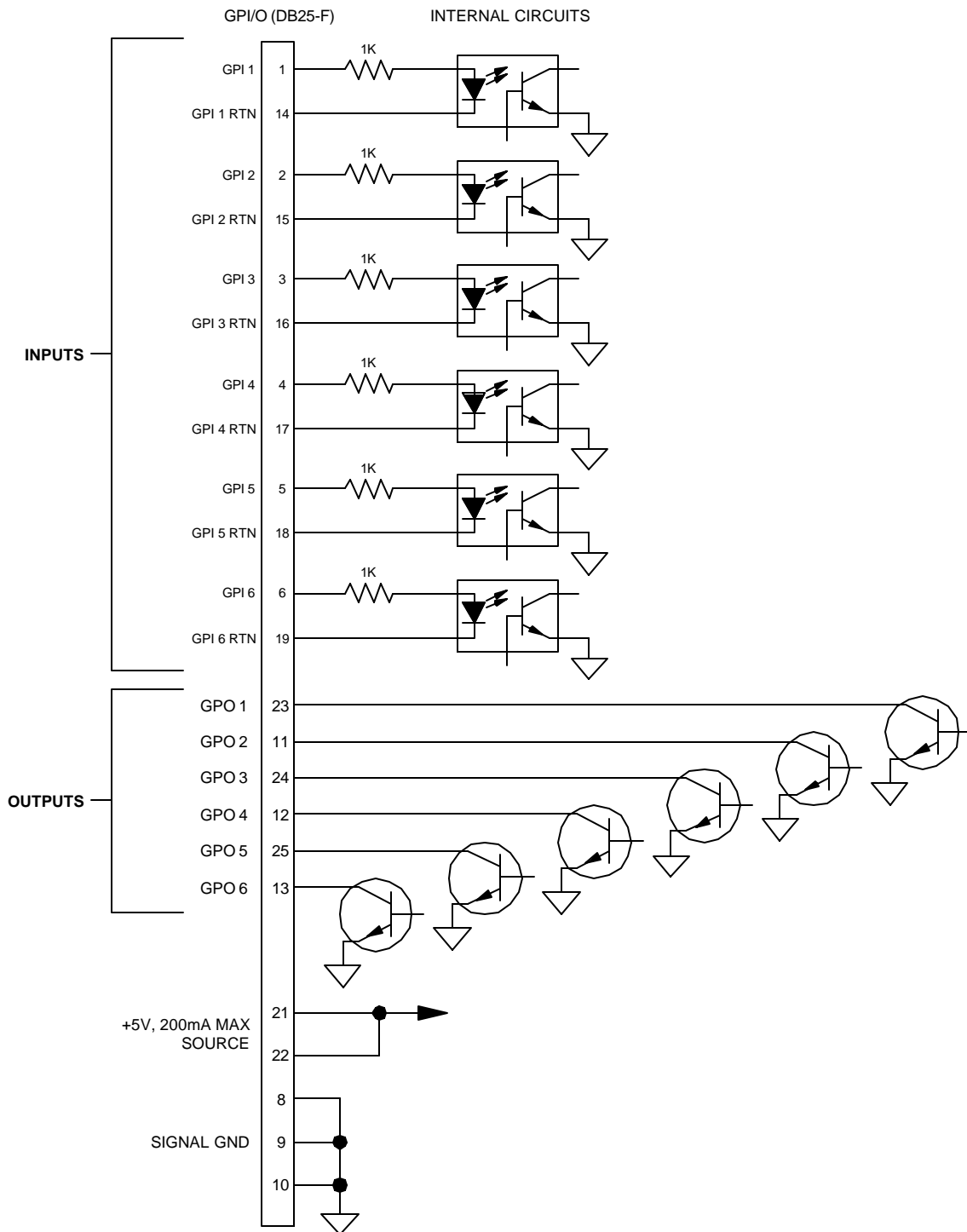


Figure 38: GPI Connection Schematic



System Board Ports

Standard computer I/O ports on the Image Server include video monitor, keyboard, mouse, and Gigabit Ethernet ports. Pinouts are provided to assist in wiring or trouble-shooting.

Keyboard and Mouse

Keyboard and mouse ports are provided on the rear panel. Both ports are provided with a resettable fuse protecting the +5V supply to the peripheral.

SVGA Ports

A VESA-compliant VGA or SVGA computer monitor may be connected to the 15-pin video port. The Image Server is pre-configured to an SVGA screen resolution of 1024 x 768 and 64,000 colors. The refresh rate will auto-negotiate with the attached monitor to achieve the best available value. This resolution is best viewed on 17-inch or larger monitors. Use only VESA compliant monitors. 360 Systems does not provide monitors for the server.

SVGA Connector Pinout

Pin	Signal	Pin	Signal
1	RED	9	+5V
2	GREEN	10	GND
3	BLUE	11	RESERVED*
4	RESERVED*	12	SDA
5	GND	13	HSYNC
6	RED RTN	14	VSYNC
7	GREEN RTN	15	SCL
8	BLUE RTN	SHELL	FRAME GROUND

* Pulled high to +5V.

Unused Ports

USB ports and an RS-232 serial port are present on the Image Server. These are not active and no connection should be made to them.

Appendix B

Serial Command Protocols

VDCP Command Table

The Image Server responds to the following VDCP commands. Shaded areas indicate commands slated for future implementation.

COMMAND FROM CONTROLLER RETURN FROM CONTROLLED DISK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
0X / 8X	15	Delete Protect ID		04	ACK
0X / 8X	16	Undelete Protect ID		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
1X	00	Stop		04	ACK
1X	01	Play		04	ACK
1X	02	Record		04	ACK
1X	04	Still		04	ACK
1X	05	Step		04	ACK
1X	06	Continue		04	ACK
1X	07	Jog		04	ACK
1X	08	Varispeed Play		04	ACK
1X	0A	EE Mode		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
2X / AX	1D	Rename ID		04	ACK
2X	1E	Preset Std. Time		04	ACK
2X / AX	1F	New Copy		04	ACK
2X	20	Sort Mode		04	ACK
2X	21	Close Port		04	ACK
2X	22	Select Port		04	ACK
2X / AX	23	Record Initialize		04	ACK



2X / AX	24	Play Cue		04	ACK
2X / AX	25	Cue with Data		04	ACK
2X / AX	26	Delete ID		04	ACK
2X / AX	2C	Record Init with Data		04	ACK
2X	30	Preset		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
3X	01	Open Port	3X	81	Grant/Denied
3X / BX	02	Next	3X	82	List of ID's
3X	05	Port Status Request	3X	85	State Status
3X	06	Position Request	3X	86	Position
3X / BX	07	Active ID Request	3X	87	Active ID
3X	08	Device Type Req.	3X	88	Device Type
3X	10	Syst. Status Request	3X	90	System Status
3X / BX	11	ID List	3X	91	List of ID's
3X / BX	14	ID Size Request	3X	94	ID Size
3X / BX	16	ID Request	3X	96	ID Presence
3X	17	Compression Settings Request	3X	97	Compression Settings
3X / BX	18	ID's Added List	3X	98	List ID's Added
3X / BX	19	ID's Deleted List	3X	99	List ID's Deleted

AX and BX versions are long-filename variants, not yet implemented.

Macro commands (5X/DX in CMD-1) are not implemented.

The following commands are reserved to maintain manufacturer compatibility with existing systems: 0X.12, 2X.28, 2X.36, 2X.3B, 2X.3C, 2X.3D, 2X.3E, 2X.3F, 2X.43, 2X.44, 2X.45, 2X.70, 2X.71, 2X.C2, 3X.20, 3X.21, 3X.22, 3X.23, 3X.24, 3X.60, 3X.78, 3X.79, 3X.7A, 3X.7B, 3X.7C, 3X.7D, 3X.7E, 3X.7F, FX.XX (archive commands)

P2 Serial Command Table

The Image Server command set includes most commands used in BVW tape machines. Commands not implemented include those for DMC operations, audio split and in/out points, and those specifically related to tape as a medium.

The server will return Device Type response 20.25 for BVW-75 (NTSC); 21.25 for BVW-75 (PAL).

COMMAND	DESCRIPTION	RETURN	COMMENT
00.11	DEVICE TYPE REQUEST	ACK	
00.1D	LOCAL ENABLE	ACK	
00.0C	LOCAL DISABLE	ACK	
20.00	STOP	ACK	
20.01	PLAY	ACK	
20.02	RECORD	ACK	
20.10	FAST FORWARD	ACK	
2X.11	JOG FORWARD	ACK	
2X.12	VAR FORWARD	ACK	
2X.13	SHUTTLE FORWARD	ACK	
20.20	REWIND	ACK	
2X.21	JOG REVERSE	ACK	
2X.22	VAR REVERSE	ACK	
2X.23	SHUTTLE REVERSE	ACK	
20.30	PRE-ROLL	ACK	
20.0F	EJECT	ACK	
20.05	STANDBY ON	ACK	
20.60	FULL E-E OFF	ACK	
20.61	FULL E-E ON	ACK	
24.31	CUE UP WITH DATA	ACK	
40.08	TIMER 1 RESET	ACK	
40.10	IN ENTRY	ACK	
40.11	OUT ENTRY	ACK	
40.18	IN SHIFT +	ACK	
40.19	IN SHIFT -	ACK	
40.1A	OUT SHIFT +	ACK	
40.1B	OUT SHIFT -	ACK	
40.2D	LOST LOCK RESET	ACK	
41.36	TIMER MODE SELECT	ACK	



41.37	INPUT CHECK	ACK	
44.00	TIMER 1 PRESET	ACK	
44.04	TIME CODE PRESET	ACK	
44.31	PRE-ROLL TIME PRESET	ACK	
41.33	SERVO REFERENCE SELECT	ACK	
N/A	TIMER MODE STATUS	ACK	
7x.20	STATUS DATA	7x.20	
N/A	COMMAND SPEED SENSE	71.2E	
40.48	REF VIDEO SELECT ON	ACK	
40.49	REF VIDEO SELECT OFF	ACK	
6x.0E	CURRENT TIME SENSE	ACK	

ACK = 10.01 NAK = 11.12.xx

Odetics® Protocol

Odetics serial protocol is an extension of P2 tape machine control protocol. Among its most significant features is the selection of a file by name rather than by time-code location, as with P2. Odetics protocol is used by many table-top controllers, and some automation systems. Its implementation in the Image Server appears in the following table.

ACK = 0X1001

COMMAND	DESCRIPTION	RETURN	COMMENT
0X1001			
0x000C	LOCAL DISABLE	ACK	
0x0011	DEVICE TYPE	0X1211	BVW-75
0x001D	LOCAL ENABLE	ACK	
0x2000	STOP	ACK	
0x2001	PLAY	ACK	
0x2002	RECORD	ACK	
0x2004	STAND BY OFF	ACK	
0x2005	STAND BY ON	ACK	
0x200D	DMC START	ACK	COMMAND HAS NO EFFECT
0x200F	EJECT	ACK	
0x2010	FAST FORWARD	ACK	
0x2X11	JOG FORWARD	ACK	
0x2X12	VAR FORWARD	ACK	
0x2X13	SHUTTLE FORWARD	ACK	
0x2020	REWIND	ACK	
0x2X21	JOG REVERSE	ACK	
0x2X22	VAR REVERSE	ACK	
0x2X23	SHUTTLE REVERSE	ACK	
0x2030	PREROLL	ACK	
0x2X31	CUE UP	ACK	
0x2X38	PROG SPEED PLAY PLUS	ACK	
0x2X39	PROG SPEED PLAY MINUS	ACK	
0x2052	TENSION RELEASE	ACK	COMMAND HAS NO EFFECT
0x2054	ANTI CLOG TIMER DISABLE	ACK	COMMAND HAS NO EFFECT
0x2055	ANTI CLOG TIMER ENABLE	ACK	COMMAND HAS NO EFFECT
0x2X5C	DMC SET FORWARD	ACK	COMMAND HAS NO EFFECT
0x2X5D	DMC SET REVERSE	ACK	COMMAND HAS NO EFFECT
0x2060	FULL EE OFF	ACK	
0x2061	FULL EE ON	ACK	

0x4X00	TIMER1 PRESET	ACK	
0x4X04	TIME CODE PRESET	ACK	
0x4008	TIMER1 RESET	ACK	
0x4010	IN ENTRY	ACK	
0x4011	OUT ENTRY	ACK	
0x4X14	IN PRESET	ACK	
0x4X15	OUT PRESET	ACK	
0x4018	IN SHIFT PLUS	ACK	
0x4019	IN SHIFT MINUS	ACK	
0x401A	OUT SHIFT PLUS	ACK	
0x401B	OUT SHIFT MINUS	ACK	
0x4020	IN RESET	ACK	
0x4021	OUT RESET	ACK	
0x402D	LOST LOCK RESET	ACK	
0x4X30	EDIT PRESET	ACK	COMMAND HAS NO EFFECT
0x4X31	PRE-ROLL TIME PRESET	ACK	
0x4X32	TAPE AUTO SELECT	ACK	
0x4X33	SERVO REFERENCE SELECT	ACK	
0x4X34	HEAD SELECT	ACK	COMMAND HAS NO EFFECT
0x4X35	COLOR FRAME SELECT	ACK	COMMAND HAS NO EFFECT
0x4X36	TIMER MODE SELECT	ACK	
0x4X37	INPUT CHECK	ACK	
0x4040	AUTO MODE OFF	ACK	
0x4041	AUTO MODE ON	ACK	
0x4046	VARIABLE MEMORY OFF	ACK	
0x4047	VARIABLE MEMORY ON	ACK	
0x4048	VIDEO REFERENCE DISABLE OFF	ACK	COMMAND HAS NO EFFECT
0x4049	VIDEO REFERENCE DISABLE ON	ACK	COMMAND HAS NO EFFECT
0x4X70	VIDEO INPUT SELECT	ACK	
0x4X91	OUTPUT VIDEO LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X92	OUTPUT SETUP BLACK LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X93	OUTPUT CHROMA LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X98	OUTPUT H PHASE	ACK	COMMAND HAS NO EFFECT
0x4X99	OUTPUT SC PHASE	ACK	COMMAND HAS NO EFFECT
0x4X9A	OUTPUT VIDEO HUE	ACK	COMMAND HAS NO EFFECT
0x6X0A	TC GEN DATA SENSE		
	GEN TIME DATA	0X7408	
	GEN UB DATA	0X7409	

	GEN U BAND TC DATA	0X7809	
0x600C	CURRENT TIME SENSE		
	CORRECTED LTC TIME DATA	0X7414	
	VITC TIME DATA	0X7406	
	TIMER1 DATA	0X7400	
	HOLD USER BITS LTC DATA	0X7415	
	HOLD USER BITS VITC DATA	0X7416	
0x6010	IN DATA	0X7410	
0x6011	OUT DATA	0X7411	
0x6012	A IN DATA	NAK	
0x6013	A OUT DATA	NAK	
0x6020	STATUS DATA	0X7420	
0x6X23	SIGNAL CONTROL DATA	0X7423	
0x602E	COMMAND SPEED DATA	0X712E	
0x602F	VAR MEM SPEED DATA	0X712F	
0x6X30	EDIT PRESET DATA	NAK	
0x6031	PREROLL TIME DATA	0X7431	
0x6036	Timer Mode Status	0X7136	
0xA001	AUTO SKIP	ACK	O DETICS COMMAND
0XAX02	CUE UP TO RECORD	ACK	O DETICS COMMAND
0XAX04	PREVIEW IN PRESET	ACK	O DETICS COMMAND
0XAX05	PREVIEW OUT PRESET	ACK	O DETICS COMMAND
0XA006	PREVIEW IN RESET	ACK	O DETICS COMMAND
0XA007	PREVIEW OUT RESET	ACK	O DETICS COMMAND
0XAX10	ERASE ID	ACK	O DETICS COMMAND
0XA014	LIST FIRST ID	0X8814	O DETICS COMMAND
0XA015	LIST NEXT ID	0X8814	O DETICS COMMAND
0XAX18	ID STATUS REQUEST	0X8818	O DETICS COMMAND
0XA01C	MAXIMUM STORAGE LENGTH	0X891C	O DETICS COMMAND
0XAX20	SET DEVICE ID	ACK	O DETICS COMMAND
0XA021	DEVICE ID REQUEST	0X8821	O DETICS COMMAND
0XCX01	JUMP FORWARD X FRAMES	ACK	O DETICS COMMAND
0XCX02	JUMP BACK X FRAMES	ACK	O DETICS COMMAND
0XCX03	GET LOADED ID	ACK	O DETICS COMMAND



Appendix C

Technical Specifications

Video	
Input Channels (baseband)	One
Output Channels	Three
Analog video I/O	Composite, 75 Ω , BNC
Digital video I/O	SDI, SMPTE 259M, 75 Ω BNC
Video standards	525/60 NTSC; 625/50 PAL (Model dependent)
MPEG recording formats	MPEG-2: 4:2:2 Profile @ Main Level to 50 Mb/s MPEG-2: Main Profile @ Main Level to 15 Mb/s (4:2:0)
DV playback format	Option: playback of 25 Mb/sec DV files imported via Ethernet.
Graphics playback format	Option: playback of TARGA files with key & fill imported via Gigabit Ethernet.
Word Size	10 bits dithered to 8
Frame format	I-frame, 6-GOP, 14 GOP
Minimum pre-roll	10 frames
Video sync reference (Genlock)	External black burst or internal crystal
Audio	
Digital Inputs/Outputs	2 stereo pairs (4 channels) per video input or output
Digital audio format	AES/EBU, 110-ohm, XLR-3 connector (AES-3-2000)
Dynamic range (digital)	144 dB (24-bit word size)
Audio format	48k sample rate, 24-bit word size, Linear PCM
Embedded audio	20-bit, 4-channel. Optional software.
Bit-for-Bit® data handling	Transparent to Dolby®-E, Dolby AC-3
Analog Inputs/Outputs	2 mono channels per video input or output
Analog audio format	Balanced, +4 dBu, XLR-3 connector
Frequency response	10 Hz – 20 kHz \pm 0.1 dB
Harmonic distortion	<0.002% THD+N at full scale –1 dB
Dynamic range	112 dB (24-bit word size)
Headroom	20 dB above nominal +4 dBu operating level
Audio sync reference	Derived from video reference
Time Code	
LTC In	External time code, > 10k Ω BNC connector
LTC Out	External time code, Z = 750 Ω , BNC connector

VITC line number, NTSC	Field 1: Lines 14, 16; Field 2: Lines 277, 279
VITC line number, PAL	Field 1: Lines 19, 21; Field 2: Lines 332, 334
Closed Captions	
Closed Captions	Records and plays CC data per EIA-608B
Control Inputs	
Automation control, RS-422	VDCP; 3 ports, 9-pin female "D" connector
Other serial control, RS-422	P2, Odetics, AMX®, Crestron™
GPI control inputs/outputs	6 optically isolated inputs, 6 open-collector outputs, 25-pin female "D" connector
Video Networking	
File interchange formats	MXF (SMPTE 377M, 378M, 381M); OP-1a, OP-1b; MPEG-2 program streams (ingest) & elementary streams; DV stream (.dv or .avi); TARGA graphics import.
Network port	Gigabit Ethernet
File transfer protocol	FTP
Disk Storage	
Storage time (max)	170 hours max at 12 Mb/s
Capacity	480 GB to 1.6 TB
Data redundancy	Hardware-generated RAID-5 utilizing 4 drives
Drive arrangement	Located within enclosure, accessible behind front panel
CD-ROM drive	Internal, replaceable from front panel. (For loading operating system and feature upgrades.)
Miscellaneous	
Operating system	Linux®
Front panel indicators	5 LEDs indicate Power-on, Genlock, Fan alarm, Drive alarm, System alarm
Miscellaneous ports	Keyboard, mouse, SVGA display
Cooling/Operating Temperature	Forced air; Ambient operating temperature 10° to 35° C
Power	100 – 240 VAC, 50/60 Hz, 2.0 amp max. Shut down switch on front panel; hard AC mains switch on rear panel
Physical	
Mechanical	3½" x 19" x 18.5" (89 x 483 x 470 mm) H-W-D
Mounting	Rack mount (2U), optional adjustable rear supports
Weight	28 lb. (12.7 Kg)
Agency approvals	UL, C-UL, FCC Class A, CE
Country of origin	U.S.A.



Keyboard Shortcuts

Transport Control	
L	Forward at 4x, 16x, 64x, 128x
K	Pause (Stop)
J	Reverse at 4x, 16x, 64x, 128x
Space Bar	Play/Pause (toggle)
R	Record
Home	GoTo Head point
End	GoTo Tail point
Shift + E	E/E Toggle
Shift + L	Loop Toggle
Shift + C	Local Toggle
Shift + J	Eject Clip
Right Arrow	Jog forward 1 frame
Left Arrow	Jog reverse 1 frame

File Operations	
Ctrl + N	New
Ctrl + O	Open
Ctrl + S	Save
Ctrl + A	Save As
Ctrl + D	Delete
Ctrl + R	Rename

Menu Operations	
Alt + F	Expands File Menu
Alt + T	Expands Transport Menu
Alt + C	Expands Configure Menu
Alt + P	Expands Playlist Menu
Alt + W	Expands Window Menu
Alt + H	Expands Help menu

Edit Operations	
E	Enter/Exit Edit Mode
I	Capture Mark In
O	Capture Mark Out
Shift + R	Review Edit
Shift + T	Review Tail

Playlist	
Home	Recue
Space	Play/Pause
K	Stop

Playlist Edit	
Shift + C	Clear
Left Arrow	<< (Remove clip)
Right Arrow	>> (Add clip)

Navigating Between Channels	
Ctrl + < number >	Switches to Transport Channel <number>
Alt + < number >	Switches to Playlist Channel <number>

Mark In/Mark Out Times (Edit Mode)	
< number >	Inserts right justified number
DEL	Removes last digit
ESC	Aborts time code entry
. ; : (any)	Shifts time code left
TAB	Toggles between Mark In and Mark Out times

Appendix D

Mechanical Drawing

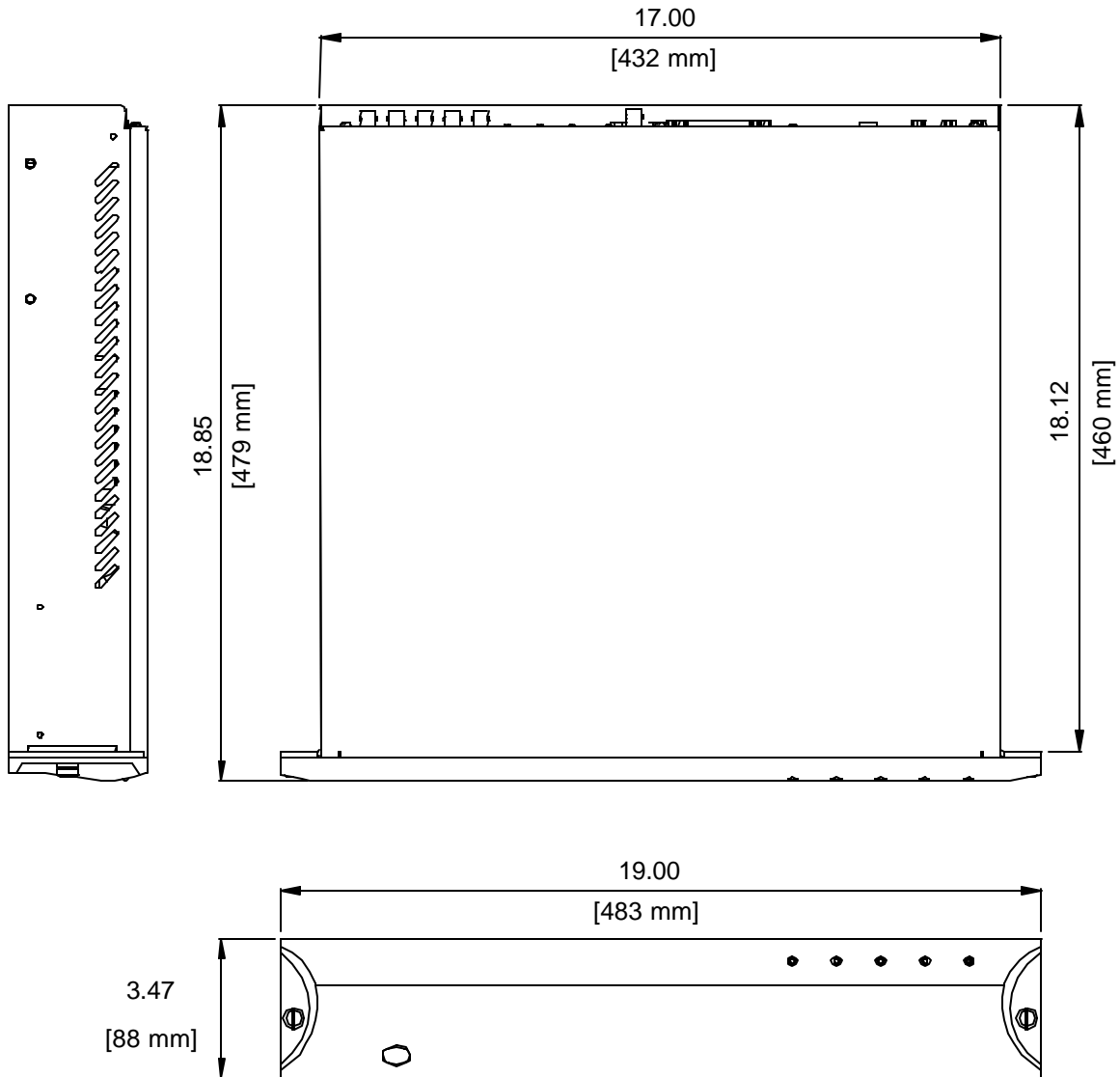


Figure 39: Dimensional Drawing



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